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FIRE AND LIFE ELECTRICAL HAZARD.

One of the subjects discussed at the recent convention of the Western Association of Electrical Inspectors, noted elsewhere in this issue, was the relation of fire prevention to public safety in general. Little argument appears necessary to establish that every life hazard increases the possibility of fire, and renders the extinguishment of a fire already started to that extent more difficult. In the report of the Association Committee on Public Safety, it is stated that during the past three or four years hundreds of fires have been traced to primary voltage on secondaries, thus showing definitely the close relation of fire to life hazard, and indicating the necessity for considering both in any treatment of the subject of minimizing danger to property or to person. This report is very strongly in favor of grounding the secondary, and adds that personal injuries from electrical contact can be absolutely avoided by the abolishment of any fittings or wires that bear current-carrying metal parts, and the grounding of any exposed metal parts which may under any conditions form a part of electric circuits, which considerations underwriters will be more and more inclined to recognize in the code as wiring construction is developed and improved. The suggested type of construction will probably at first be merely recommended for certain specified locations, and its application subsequently extended, until finally it will be recommended for general use and in the end required for all service.

THE ILLINOIS CONVENTION.

The Illinois State Electric Association attracted over 100 central-station operating men to its convention at Alton last week, a record of which the officers of that association may well be proud in view of the past history of the body. One gratifying feature of the discussions at this convention was the unanimity of opinion expressed on the subject of rates. The authors of papers and discussions practically all agreed that a proper system of rates for electric service should recognize the two elements, namely, fixed charges and variable running expenses, and that whatever the exact figures adopted by a company, these two elements should enter in making the kw-hour rate. It is not by any means to be taken from this that there is unanimity of practice among Illinois central stations in this respect, but it shows that an increasing number of central-station men have given the question intelligent analysis. It is to be regretted that such great diversity in systems of rates exists in practice. Nevertheless, if central-station owners are becoming unanimous as to the proper course to pursue, this lack of uniformity is likely to disappear gradually. The appointment of a committee to recommend uniform methods to the next convention will not by any means effect immediate reform of inconsistent rates, but its report will at least serve as a guide in the right direction for the small companies which

for the past 15 years have passed over the volumes of discussion on the rate question that has appeared in the technical press and in the proceedings of central-station bodies. It is indeed difficult for those who have studied this matter for years to realize the ignorance of the first fundamental principles of rate making among some of the smaller companies.

The discussion on gasoline lighting, which took up considerable time, was not quite so profitable. It would seem, in view of the widespread displacement of gasoline plants with tungsten lamps in cities where the central-station companies and contractors have properly pushed the matter, that it would be more profitable for a convention to listen to a recital of the experiences and methods of companies which have waged such a campaign successfully than to the experiences of those which still have a large number of gasoline plants in their territory. The discussion on electric motors was valuable for the very reason that it was an account of experience as to what had been actually done by various companies in the way of getting electric motors properly introduced. It was apparent that the excellent practice of installing motors on trial where the advantages of their use seem certain to the central-station company, is meeting with great success. Trials of this kind are more convincing than much argument; and the success reported with this method is such as to force it into the consideration of every company that wishes rapidly to build up motor business in localities where steam and gasoline engines are numerous.

The American Electrochemical Society.

Four years ago it was thought by many members of the American Electrochemical Society that two annual meetings are one too many, and it was then suggested to hold one large annual meeting each spring, at different places from year to year, and another meeting each autumn in New York City. This plan has worked so far very well, but the original intention of making the New York meeting secondary in importance has gradually been lost sight of. This year, with a New Yorker, Dr. L. H. Baekeland, as president, it was only natural that New York should make a special effort in behalf of its meeting, and as a result the sessions just closed proved to be of exceptional interest, both professionally and socially. The program of papers emphasized again the remarkable range of interest covered by the society. Dr. E. F. Smith's experimental lecture on new methods of electro-analysis was the summary of a succesful and active life's work and, besides its intrinsic scientific value, was a most enjoyable human document. The 21 other papers presented covered a wide range of subjects, including a paper of much metallurgical interest by Professor Burgess on carbon-free alloys of iron and copper; on the latest method of the Badische Company for making nitric acid from air; three papers on electrode losses in electric furnaces, and a paper by Dr. Richards on the role which a stray field of current plays in electric conductance in metals and electrolytes.

Of the papers which were of special interest to electrical engineers, that of Dr. Weedon on the titanium carbide arc is the result of a long extended research involving many different materials. An equally prominent example of the successful work now carried on in the research laboratories of our large manufacturing companies was contributed in Dr. Weintraub's paper on the preparation and properties of pure-fused boron, the investigation of which has opened many possibilities where resistors with certain temperature-resistance coefficients are desired. Mr. Spalding's paper on power for copper refining deserves the careful attention of central-station engineers. Mention should not be omitted of the two papers presented by Mr. Loveridge and Professor Burgess on dry cells. The importance of the dry-cell industry is probably little appreciated, though according to a reliable estimate made two years ago the number of dry cells used in this country was then more than 30,000,000 a year. As a result of the presentation of this subject at the meeting, we understand that a Committee on Standardization will be appointed to outline specifications and tests for dry cells. On the whole, the meeting has shown that the American Electrochemical Society is as wide-awake and progressive as ever. By deciding to hold its next meeting at Pittsburgh, the society enters what is no longer the enemy's country, but, on the contrary, a field where electrometallurgy will undoubtedly find in the near future a wonderful development.

Lighting Load and Population.

An interesting statistical study by Mr. Alton D. Adams elsewhere in our columns contains some interesting material in the way of a study of the relation between population and electric service in an important urban and suburban district of which our readers will probably surmise the location without the aid of a Sherlock Holmes. The situation is, however, thoroughly typical of what may be found in many other districts of the country. Considered graphically, the results show that there is no ascertainable relation between population, number of consumers and connected load, even in the same general territory where the electrical supply is substantially at the same rates throughout. The one point in the statistics which strikes one most forcibly at first sight is the small number of consumers per 100 of population, even in a prosperous district where the electric rates are on the whole low. The highest percentage of consumers to population reached anywhere in the territory concerned was 6.9 per cent, while the great urban district itself showed only 3.2 per cent, although in the latter case the number of lamps per consumer was considerably greater than in the former.

The figures show upon their face how very far electric light is from being generally treated as a necessity. The same territory here considered has more than three times as many telephones as it has customers for electric light, which shows how far the telephone has come to be regarded as a necessity. Mere smallness of population does not seem in any way to hinder a good market for electric light, since in the eight districts considered by Mr. Adams, the one with the smallest population has relatively the greatest number of consumers and has the greatest number of lamps installed with respect to the population, this number being 244 16-cp equivalents per 100 of population. The smallest proportion of consumers happens to be in a district of just about the same size as that mentioned. This place of extraordinary low load happens to be peculiarly a manufacturing community, consequently with a large number of relatively poorly-paid wage earners. On the other hand, the small district which shows a remarkably large number of electric lamps is an important residence district, a relatively wealthy community, which goes again to show the point of popular conception, that electric light is rather of a luxury than a necessity.

The great urban district under consideration has, of course, like most American cities, a large population of the poorer classes and also cheap gas supply, which it also should be said covers a great deal of territory not yet touched by a house-to-house electric service. This fact is probably the most significant one in determining the number of consumers. But looking at the matter from any one place it shows that there is a tremendous market in almost any urban and suburban territory which ought to be made profitable by the electric supply stations. To do so, it is of course necessary to cover the territory pretty thoroughly, especially the urban territory, since where electric service is not easily obtainable or where it is difficult to secure electric connections, the natural result is a small sale of energy. The competition from gas seems to cut very little figure in the game, since in one territory which furnishes an excellent electric load, gas is everywhere obtainable and decidedly cheap, much cheaper than usual in similar territory. Most of all, however, the small number of consumers is due in this case, as in many others, to the fact that the small consumer is seldom honestly cultivated by electrical supply companies, and while the rates to large consumers may be extremely low the rates to the small consumers are always and everywhere practically the maximum.

To put the fact baldly, the residence consumer is very nearly punished out of existence by having to pay substantially the maximum rate, not only in such territory as Mr. Adams is discussing, but quite generally. The maximum meter rate quoted is 12 cents per kw-hour, and it would have been very interesting if Mr. Adams had also been able to give us the number of consumers in each of the districts considered who actually paid this maximum rate. Had he done so we are inclined to think that the apparent mystery of the smaller number of consumers would have been made evident at a glance. It is the rare exception when a residence consumer gets the benefit of discounts which amount to anything, although, of course, he may not be entitled to them on the particular theory of charging adopted by the given central station. But the fact is that electric rates in this country have gradually been tending to a greater and greater discrepancy in the price charged the small consumer and the price charged the large consumer, a tendency, the effect of which has been painfully manifest in some sections through drastic rate regulation. The small consumer individually is without much influence, but collectively he is forced to be dealt with, and experience is beginning to show that he will not stand for any great inequality of rates. Consequently, it behooves the central station to deal with him more gently than has been the case and to realize that the public service corporation is most truly prosperous when it has many friends rather than a few enthusiastic friends who are the fortunate recipients of low rates owing to their large consumption of energy. The long and short of the matter is that the time has come when, if central stations are to keep on increasing their business and consequently increasing their revenues, it behooves them to start a vigorous campaign among relatively small consumers, and if necessary to revise their system of charging so that the small consumer will not of necessity turn to gas. Some central stations which we could mention have adopted the policy of booming electric lighting and electricity generally and have made a distinct success in spite of gloomy predictions of failure made by some of their contemporaries.

Report of French Committee of the International Electrotechnical Commission.

A report recently printed by the French committee of the International Electrotechnical Commission is a precise and business-like document, which does credit alike to that committee and to the representatives of electrical engineering in France. The report, embracing 28 printed pages, contains the statutes of the international electrotechnical commission (I. E. C.), as adopted in London last year; the statutes of the French Committee, as adopted at Paris in 1907; a list of the French Committee-members, and of the various French technical societies that they represent; a list of the varous national committees outside of France; and a résumé of the proceedings of the last meeting of the commission council at London in 1908. It will be recalled that this country was not officially represented at that meeting, though contributing to the support of the commission. The French committee is composed of representatives of French electrotechnical societies, on the stated basis of 1 per cent of the membership of such societies. In the case of societies not exclusively connected with electricity, a reduced representation is allotted. The most prominent French electrotechnical society is the Société Internationale des Electriciens, with 15 representatives. Nine other societies add 21 more names to the list. The local statutes, or by-laws, of this body contain 21 articles, and give a complete local working organization. Two working sub-committees are scheduled, one on nomenclature and symbols, the other on machinery and apparatus. The main body is required to meet at least three times a year. The official representatives of the French committee at conventions, either of the I. E. C. or of its council, are scheduled and printed. The plan of having all important national electrical bodies represented on such a committee appears to be an excellent one, and might with great benefit be adopted in this country.

The countries now possessing national committees of the I. E. C. are listed in the following order: Germany, Belgium, Brazil, Canada, Denmark, Spain, United States, Great Britain, Hungary, Italy, Mexico and Sweden. The British body has, like that of France, issued printed reports of its work. Each of these national committees has at least a president and a secretary, the American body in addition having two vice-presidents. Each such committee enrolls on the average 15 members, and in a few cases the organization is so far complete that sub-committees on different subjects are scheduled. The total number of names on all the national committees, including France, appears to be 219—a powerful aggregation of picked men.

It was at first supposed, from the attitude of her representatives at the preliminary conference, that France would be one of the least active large countries in the movement towards international electrotechnical standardization; but judging from the prompt and efficient manner in which the French committee handled the proposal for an international candle, which has since become universally adopted or admitted, as well as from

this recently published fine report, we may look for earnest and active co-operation from our French confrères in the future.

It is now high time that our own Institute of Electrical Engineers should bestir itself in the same good cause. The original suggestion for the formation of the commission started here, and it was first formally expressed at the St. Louis Congress; but up to the present time, the Institute has taken only a diminutive part in the international proceedings, its activities apparently having been confined to distributing the honors of membership in the national commission organized to co-operate in the work of the international body. It is to be hoped that from this time the American Institute may pull a more powerful oar in the international boat. Hitherto, by having a committee on standards separate from the National Committee of the I. E. C., the tendency has been to waste time and effort in their mutual activities. If, however, the Institute were to consolidate these two committees, the work should be greatly facilitated, and the efficiency increased. A strong committee engaged both on international and on local standardization questions can work much better than two committees working in the separate fields and hesitating to take action without mutual consultation.

The Regulation of Wireless.

We have several times taken up the necessity of proper Governmental regulation of the scores or hundreds of amateur, and, for that matter, commercial and Government wireless stations that daily afflict the overburdened ether with their sputtering. As spring brings a sort of recrudescence of general human foolishness, it starts into renewed activity all the schoolboys, would-be inventors and hungry promoters with their various apparatus, so that legitimate wireless business is interfered with in a somewhat serious manner. Fortunately, most of the over-curious experimenters have not the funds for putting up elaborate antennæ and are rather short of power, so that their chief occupation is merely interference with the proper reception of long-distance messages; but an increasing number means added chance of trouble and it is high time to call a halt, not upon experimenting, but upon the misuse of it and upon merely inquisitive meddlers. It has now been well established that the most important function of wireless telegraphy is marine communication, and it is self-evident that the value of the system for this purpose depends on freedom from interference. Most ships fitted with wireless are not provided with long antennæ or very powerful sending apparatus, as compared with the big land stations, and hence their business messages or calls for help are easily interfered with by small plants in seaboard cities. Receiving stations adjusted to pick up messages from ships are continually bothered by unknown meddlers, sometimes merely thoughtless or stupid, sometimes malicious.

If accurate syntonism were practicable over a wide range, which it does not seem to be at present, the trouble would be less acute. As things now stand, however, while a receiving station can tune out interference from certain sending stations, it cannot remain in touch with ships' equipments over any considerable distance without being bothered by multitudinous amateurs sending at all sorts of frequencies. The situation grows more serious as more and more ships are fitted with wireless and come to depend more and more upon it. They may often interfere with one another, but in the use of equipment that may make the difference between life and death, they have sufficient sense of responsibility to keep out of mischief. It is high time to undertake friendly but extremely thorough regulations, for amateur seaboard stations are much in the position of amateur lighthouse plants, interfering with the legitimate safety precautions with respect to navigation, which are peculiarly the business of the Government. It may be contended that private persons have the right to experiment even with lighthouse lenses, but, granting this, they should be compelled, and can be legally compelled, to desist from so experimenting as to interfere with navigation. Congress has ample powers under the Constitution to pass Federal statutes forbidding any and all acts inimical to public safety, and Federal authority is fully competent to enforce them. With the present tendency to make the installation of wireless apparatus compulsory on ocean-going passenger vessels, close regulation becomes imperative.

Just how this can best be accomplished with the least inconvenience it will take some experience to determine. The first and most obvious step is to require a Federal license for every wireless installation of every kind, the application for it being accompanied by proper certification of the applicant as a responsible and trustworthy person, who should appear in person before the proper local authority and take oath to obey the regulations under which license may be granted. A full specification of the apparatus to be installed should be given, together with the purpose for which it is installed and the stations with which it is proposed to communicate. With these data it would be feasible to specify the power and range of sending permissible, and to classify the station so that it should produce the minimum interference with its neighbors. As syntonism advances, this classification should become simpler and more effective. When a license is granted the licensee should receive assignment of an official call and an official year book with the specifications and calls of all licensed stations. Government and private stations authorized to do maritime work should have absolute precedence over all others, and other licensed stations should be kept to specifications that will insure freedom from interference. The chief thing is to prevent private and experimental stations from such sending as may interfere with the proper reception of messages from ships or between Government stations. Provision should be made for absolute cessation of sending, except from authorized maritime stations, in case of distress signals being received, the hearer to communicate at once by telephone or wire with the nearest such station. The exact details of regulation would have to be worked out by experience, but the task is not a difficult one if taken in hand at once. The chief trouble is likely to be that which may come from delay. The aim in view should be to discourage the merely curious, to extend to the bona-fide investigator all the assistance practicable, and to insure a chain of co-operating stations, public and private, all along the coast able to keep up a complete chain of communication with each other and with ships. In addition, the United States should take a hand in forming a group of powerful stations able to cover the whole

Atlantic, so that no properly equipped ship should be out of touch with land signals from one shore of the ocean even to the other.

Color Photometry.

Mr. P. S. Millar's paper on this subject at the recent convention of the Illuminating Engineering Society did good service in calling attention to the need of doing something definite about the comparison of lights of various colors. At the present time, when the light from commercial illuminants displays so wide a color range, it is certainly most important to come at least to a definite conclusion as to the precautions taken and methods to be employed in the commercial comparison of various illuminants. As Mr. Millar shows in his paper, even lamps differing so little as do ordinary carbon filament incandescents on the one hand, and tungsten lamps on the other, still present sufficient color difference to provoke very noticeable if not serious photometric errors. He mentions one instance in which two observers using the Lummer-Brodhun screens obtained differences as great as 3 per cent in making this sort of comparison.

Although after some months of such work there was no longer any constant color difference between the readings of the two observers, the case directs attention to the psychological errors involved in such comparisons. Different observers vary in their conception of what constitutes a balance between two differently colored lights. Although in the case just mentioned the two observers ultimately settled down to the same conception of balance, it is altogether uncertain whether one observer was right from the start and was ultimately joined by the other observer, whether the one ultimately wandered from the truth and merely made the same error as the other, or whether both were originally wrong and unconsciously compromised on some value between their original conceptions, which may or may not have been a correct value. As the color difference increases so does this psychological difficulty, until in comparing lights differing as much as an incandescent lamp and a mercury arc, the possible errors rise to a very considerable percentage. In another place Mr. Millar gives a report of the comparison of carbon lamps and a mercury-vapor lamp with different intensities of illumination upon the screen corresponding to the different distances of the lamp from the photometer, and even in this case, taking the means of determinations of two observers a maximum difference of 37 per cent, due to color differences, was found in changing the illumination from the screen with one of the photometers employed. With very strong illumination the determination was easier and more accurate, but it would still be interesting to know what the actual readings of the two observers showed in the way of variation. Difficulties of a similar kind, but of less degree, are quite certain to be encountered frequently in commercial photometry, and Mr. Millar's recommendation that the Illuminating Engineering Society should take the initiative in endeavoring to aid the work of standardizing, or at least conventionalizing commercial photometry, is a very important one.

The use of the flicker photometer in such work is a much-mooted question. It has been alternately lauded and condemned as an instrument of abolishing the difficulties of color difference. It certainly can be depended upon to give constant readings under conditions where the ordinary photometers vary widely, but whether the consistency means accuracy is quite another matter. Claims have been made, for instance, that with the flicker photometer a color-blind person would make the same readings as one with normal vision. If this were correct then certainly the photometer must mislead, because the luminosity values for lights of different colors to a color-blind person are absolutely not the same as they are to the normal eye, and should not give the same photometer readings. On the other hand, some experiments with color-blind persons seem to show that their settings of flicker photometer are not the same as those made by observers with normal vision. In the latter case one may assume that the flicker photometer actually did give correct values in spite of the color difference, or that it led to a new kind of error. Nothing save a very thorough investigation of the subject by numerous observers working independently can clear up facts that seem so irreconcilable. Again, it has been proposed to work on the basis of threshold acuity in comparing lights of two radically different colors. There seems little doubt that observers trained to make such comparisons according to a definite routine can obtain consistant results, but observers working independently and not according to a fixed routine are absolutely certain to get diverging results from mere differences of adaptation which rise at times to very large amounts, and no one can say whether the agreement obtained by specially trained photometric observers is indicative of precision or not.

A more useful modification of the acuity idea is the acuity wedge of which the two sides are covered with suitable characters to be read, and the wedge is slid along the photometer board until a balance of ease in reading is struck. We do not remember that this form of apparatus has yet received a suitable amount of attention, but it would seem to have value in that it compares at least one thing which is important in judging the relative luminous value of colored lights—that is, the ease with which one can see to read by them. Still another proposition is to use absorbing screens properly standardized by the co-operation of many observers or to fall back on what is virtually spectrophotrometry in a simplified form—that is, a comparison of two lights merely in terms of their regions of greatest luminosity, following the general method laid down by Crova. All these diverse suggestions must be carefully considered and threshed over before heterochromatic photometry can be satisfactorily dealt with, and it is high time to begin work on the subject, since the amount of labor involved in the investigation is obviously great. One has only to read over the discordant opinions expressed by various investigators in various papers dealing with the matter to realize the immense difficulties of the situation. The chief practical requirement is to settle upon some reasonable simple method of working with general illuminants in such a way as to avoid as far as may be the psychological and physiological difficulties. Such method when found may prove to be somewhat empirical and perhaps lacking in fine experimental precision, but the errors just mentioned are so much larger than any ordinary instrumental errors, or errors of reading, that the first step toward success is to get them out of the way in so far as is practicable. One can get along very comfortably with a photometric method of only moderate ultimate precision if using it will escape errors of concept and errors of adaptation of a much more serious order of magnitude.

Decision on Water-Power Development on a Normally Navigable Stream.

The Economy Light & Power Company, of Joliet, Ill., of which Mr. Samuel Insull is president, has been victorious in the litigation growing out of the contention of the State of Illinois that the Desplaines River is a navigable stream and that, therefore, the company's development at Dresden Heights, Ill., should be abandoned. The company has maintained a water-power plant at Joliet for a number of years, and about three years ago it purchased land for a distance of about 4.5 miles on each side of the Desplaines River at Dresden Heights, which is where the Desplaines and Kankakee rivers join to form the Illinois River. All the land that would be overflowed by reason of the building of a dam was purchased. The company started to build the dam, but in December, 1907, the State authorities, at the instance of the Governor, brought suit to enjoin the construction of the dam. This injunction was sought on three grounds:

First, it was contended that the river is a navigable stream in which the public has an easement for navigation and which, therefore, may not be obstructed by private works. Second, it was asserted that the State actually owned the land in the bed of the stream at the location of the dam. Third, certain contracts and deeds obtained from the commissioners of the old Illinois and Michigan Canal, which parallels the Desplaines River, relating to small pieces of property owned by the State in the vicinity of the dam, were said to be void.

The suit came on for hearing before Judge Mack sitting as a circuit judge of Grundy County in April, 1908. The answers of the water-power company to the contentions of the State were as follows:

First, the stream is not "navigable" in the legal sense, because in its original state (before the water of the Drainage Canal was turned into it) it did not have the capacity to carry any useful commerce by reason of insufficient water, steep declivity, tortuous windings and other obstacles to navigation.

Second, the State, represented by canal trustees who then had charge of the lands of the Illinois and Michigan Canal, lawfully conveyed the land in the bed of the river in 1859, and the company acquired the title of the transferee.

Third, the contracts referred to in the third contention of the State were within the power of the canal commissioners to make; and it was also pointed out that work done under them would not injure in any way the Illinois and Michigan Canal.

Twelve weeks were consumed in the arguments before Judge Mack and later the court gave its decision in favor of the Economy Light & Power Company on all the points in suit and dismissed the bill for an injunction. The State appealed to the Supreme Court, and the appeal was argued at Springfield at the April term, 1909. The Supreme Court's decision has just been received, and it sustains the previous decision of Judge Mack at every point and, therefore, the contentions of the water-power company. The law firm of Isham, Lincoln & Beale and also the firm of Scott, Bancroft & Stevens, of Chicago, appeared for the company, and Messrs. Merritt Starr and Walter Reeves (deceased) were the attorneys especially appointed to represent the State.

The case has attracted a great deal of public attention owing to the proposal to use the Desplaines River as a part of the deep waterway between Chicago and the Mississippi River. It will, no doubt, be feasible to construct the deep waterway and at the same time utilize the power of the Desplaines River at this point, but in that case the State administration could not develop the power itself, as is believed to be its desire, unless condemnation proceedings were instituted under an act which might be passed by the Legislature declaring it to be the policy of the State to utilize the Desplaines River as a part of the deep waterway.

The opinion of the court accompanying the recent decision of the Supreme Court of Illinois was written by Judge Vickers and was handed down on Oct. 26. On the question of the navigability of the Desplaines River as affected by the deep-waterway project there is one passage in the opinion which is of special interest. It is as follows: "What the future will see accomplished along these lines no one can know. It may be that when that future is unfolded it will bring a realization of the hopes of the most optimistic, and that the appearance of sea-going vessels plowing through the prairies of Illinois, laden with the people and products from the uttermost parts of the earth, will be as common as the now almost forgotten 'prairie schooners' of 1849 were in those days. But if this transition is to occur —if the powerful hands of the Government are to lay hold of this gigantic enterprise—they must do so with due regard to the sacred right of every citizen, however humble and insignificant those rights may seem in contrast with the great public consummation."

British Bremer Lamp Patent Declared Invalid.

On Oct. 18 judgment was delivered by Justice Joyce, of Manchester, England, declaring invalid a patent granted in 1902 to Hugo Bremer for improvements in electric arc lamps. The Court considered that the plaintiff's patent, even if otherwise valid, had been anticipated by an American patent in the name of Graham; but the ground upon which he decided the case was that in the so-called invention as claimed there is no real invention or special matter to support a patent. He held that there could not under the circumstances be a patent merely for the use in any new or special kind of arc lamps, of that which was already known and commonly adopted in ordinary arc lamps for practically the same purpose.

Edison Entertains Japanese.

After visiting the lamp factory of the General Electric Company and other manufacturing establishments in Newark, N. J., last Wednesday, the Japanese commercial commission, which is making a tour of this country for the study of our various industries and commercial methods, paid a visit to Mr. Edison at his laboratory in West Orange. As they had expressed an earnest desire of meeting him personally and of examining the great industrial plant established by him in the vicinity of the

JAPANESE COMMERCIAL COMMISSION AT EDISON LABORATORY.

laboratory, the inventor had previously extended a cordial invitation.

There were about 50 in number, including six ladies, and they were accompanied by several prominent citizens of Newark, as well as by members of various trade and mercantile bodies from other sections of the country. Five of the six ladies were wives of the members of the commission, while the sixth was a companion of Baroness Shibusawa, whose husband was the head of the commission.

The party arrived at the laboratory in automobiles, and were conducted into the library where they were received and

entertained by Mr. Edison in his characteristic genial manner, and who was kept exceedingly busy answering the numerous questions propounded by the eager and interested visitors, most of whom speak good English.

The official heads of the various Edison industries located in the neighborhood of the laboratory were present with a force of about 20 of their subordinates to take the visitors in groups through the shops, and everything was done to facilitate the object for which they had made the trip.

In accordance with the previously expressed wish of the commission the group was photographed, with Mr. Edison in the center. The elderly gentleman immediately at his right in the accompanying reproduction of this photograph is said to be the John D. Rockefeller of Japan. Mrs. Edison sits immediately to the left of her husband.

The visitors' registry at the laboratory is enriched in picturesqueness by the autographs of the visitors.

Electrical Trades Association of Chicago.

Closing a fiscal year of successful accomplishment, the fourteenth annual meeting and dinner of the Electrical Trades Association of Chicago will be held at the University Club, Chicago, on the evening of Nov. 12. Mr. Charles E. Brown, of the Central Electric Company, will act as toastmaster, and the list of speakers includes Mr. Samuel Insull, president of the Commonwealth Edison Company; Mr. H. E. Hackenberg, treasurer of the National Carbon Company; Mr. James Wolff, president of the National Electrical Trades Association; Hon. William F. McSurely, judge of the Superior Court of Chicago, and Mr. Charles E. Kremer, who is spoken of as the wit of the Chicago bar. The entertainment committee in charge of the affair consists of Messrs. William P. Crockett, A. O. Kuehmsted, J. F. Gilchrist, H. L. Holland and W. P. Johnson. There is also a nominating committee consisting of Messrs. W. D. Rumsey, Henry Schwab, G. A. Roth, H. B. Davis and W. H. Gross. These two committees together constitute the reception committee.

The membership of the Chicago association is said to embrace all of the representative electrical manufacturers and jobbers in the territory from Cleveland to Denver, extending as far south as New Orleans. These members, 210 in number, cooperate with similar associations having headquarters in Boston, New York, Philadelphia and San Francisco. The members exchange information relating to the credit of customers, and the association also extends its help in the collection of accounts. But the main objects of the association are to protect the mutual interests of members, to work for uniformity and improvement in the customs and usages of the electrical trade and to settle differences among members. Since the organization of the association in 1896, Mr. Frederic P. Vose has been the secretary, and his office in the Marquette Building has been long recognized among electrical manufacturers and jobbers as the credit center of the industry in Chicago. The association is powerful, but it has never used its power tyrannically and has a record of helpfulness directed to the general good of the trade.

Worcester (Mass.) Electric Light Company to Build New Plant.

Following the decision of the stockholders to retain the present management of the Worcester Electric Light Company, it has been decided by the directors to build a new and thoroughly modern generating station in the southern part of the city and to use the present generating plant as a distributing station. Eight acres of land have been purchased from the Curtis Manufacturing Company, with water rights in Curtis Pond and Ram's Horn Brook, and the new station will be erected beside the pond on Webster Street, with special provision for the economical delivery of coal by rail via the New York Central Lines. The area of Curtis Pond is sufficient to provide ample water for condensing purposes and also boiler feeding. Mr. George T. Dewey, counsel for the company, stated at the time of the purchase that the site is regarded as one of the best in the country for a modern station, and that the money to be expended in the new plant, equipment, and on the property will approximate $350,000. It is expected that power can be produced on the location at reduced cost, the manufacturing expense per kw-hour at the Faraday Street station being about 1.25 cents. The old station, which has been described in these columns in connection with a gradual transition from a line shaft and belted plant to a modern direct-connected installation, is handicapped by the absence of railroad facilities and limitations in regard to water supply. The center of distribution is about ¾ mile south of the old station, while the new plant will be about 2½ miles south of the distribution center itself. In case arrangements are later made with the Connecticut River Transmission Company for a certain amount of power to be utilized on the company's system, the location of the old station will be favorable to convenient connection with the Transmission Company's system. Plans for the new power house will be prepared at an early date and new machinery purchased. Active efforts are also under way to extend the company's power service and connected load.

Proposed Baltimore Municipal Lighting Plant.

In view of the expiration in September, 1910, of the contract for city lighting, Mayor Mahool is gathering data on the subject of a municipal electric lighting plant. An investigation of the availability of the old garbage reduction plant at Port Covington was made by Mr. Robert J. McCuen, city electrician, and the report which he has just submitted to the Mayor is favorable to the establishing of a municipal plant on this site. Mr. McCuen's report states that such a plant can be erected at Port Covington at a very small cost in comparison to the outlay that a site on the city's water front would require. Steam could be used as the power of the plant on the Covington site and the cost would be greatly reduced. Mr. Preston, the building inspector, has been instructed to visit the present plant and determine whether any difficulty is to be anticipated with respect to foundations.

Hamilton (Ont.) Street-Lighting Arbitration.

The hearing of evidence in the arbitration of the street-lighting contract made by the city of Hamilton, Ontario, with the Cataract Power Company in June, 1899, was resumed last week. It will be recalled that the judge, on the former hearing, gave his award allowing the city a rebate of $15.50 per lamp per year on something over 400 lamps, aggregating about $6,000 per year for the last five years of the term of the contract, from 1904 till the end of 1908.

The Cataract company thereupon appealed from the award, and the Court of Appeal gave its decision referring the whole question back to the original court, with the suggestion that the company's books and plant should have been open for investigation. In deference to the Appeal Court's decision, an order was recently made by Judge Snider permitting experts appointed by the city to inspect the books and plant of the company, and it was for the purpose of hearing the evidence of these experts that the arbitration was resumed.

The city was represented by Mr. Hugh E. Rose, K. C., of Toronto, and City Solicitor F. R. Waddell, while the side of the company was presented by Messrs. George S. Lynch-Staunton, K. C., and W. W. Osborne. The evidence given by the experts for the city was not very satisfactory, the accountant testifying that he was unable to ascertain from the company's books anything that would show the cost of producing power for street lighting in either 1899, the year in which the contract under arbitration was made with the company, or 1904, from which

period the city claimed the reduction in price. The electrical expert who had been over the company's plant submitted certain details of cost of plant and equipment, which were similar in most respects to those given by the city's expert in the original hearing.

The company, however, presented a new witness, Mr. Percy H. Knight, who was formerly engineer in charge of construction at Provo, Utah, for the Telluride Power Company in 1899. Mr. Knight testified that since he had been in Utah nothing new had been discovered in the electric art that would lessen the cost of energy to the city. By regulating the use of water and the voltage in different proportions, the cost could be slightly lessened, but eliminating the water question, he thought there was no other way to reduce the cost from what it was in the year 1899. This testimony has an important bearing on the arbitration, since the judge has to base his award upon the terms of a clause in the original contract which reads that should "improvements and advances be discovered in the electrical art" the city shall be entitled to a reduction in price for the last five years of the contract. The hearing was adjourned till Nov. 5.

The special power committee met on Thursday last and passed a recommendation to the Hamilton City Council to sign a contract with the Hydroelectric Power Commission for 1000 hp under the terms offered last June by the commission, with the option of entering fully into the project by Dec. 31, 1910.

If the Council adopts this course it will put an end to a question which has been foremost in municipal circles for the last three years. Though the power committee passed the recommendation in favor of the hydroelectric power, the members were not unanimous, the Mayor and two Aldermen reserving their right to deal with the question at a following Council meeting, which would indicate that the struggle is not yet over, though it is well known that a majority of the Aldermen are in favor of taking power from the Hydroelectric Commission.

Boston School Committee May Appeal from Commission Rate Ruling.

There is a prospect that the Boston School Committee may appeal to the courts as a result of the recent ruling of the Massachusetts Gas and Electric Light Commission that the school houses are not entitled to lower rates for electricity than other consumers of the Boston Edison Company. The board ruled that such a practice would be discriminatory, as reviewed in these columns at the time, and held that it could not properly ask the Edison Company to make a reduction. Had a reduction been made the city figures that it would have reduced the cost of lighting and power for school service by about $20,000 per year. The Edison Company admitted that the city is a large user, but that the scattered nature of the load rendered it out of the question to give special rates, and the commission sustained the company's position. The School Board has under consideration the possibility of establishing plants of its own, but it is questionable if the inauguration of such a municipal service would not cost the city far more in the long run than the present supply from the Edison Company. The situation is one of much interest to central stations in the State.

Distributing Freight by Electricity.

In an illustrated lecture before the New York Electrical Society, on Oct. 28, Mr. G. Herbert Condit described the antiquated methods employed in America for handling freight in less than car-load lots at railway terminal and steamship docks. Statistics show that the cost of transferring package freight by trucks from a boat to the distributing points ranges from 20 to 50 cents per ton. When this value is compared with 0.1 cent as the cost of removing coal from barges, elevating it and conveying it to bunkers by means of electric motors, the advantages to be gained by substituting electricity for hand power will be appreciated. In European cities, especially in Germany and France, electric cranes, travelers and telphers are extensively employed at steamship docks, but such labor-saving devices have been introduced to only a limited extent in this country. Freight-handling devices have been highly developed for certain services, and combinations of these devices, as now obtainable from a large number of companies, are immediately available for solving the problem of handling and distributing freight at railroad terminals and steamship docks.

Mr. T. C. Martin gave estimates of the money expended in New York for transferring freight and claimed that electricity will revolutionize the methods employed in handling package freight by reducing the cost to probably one-seventh of the present amount. He outlined the pioneer electric telpherage experiments conducted by Mr. H. M. Harding on Madison Square Garden roof in New York.

Mr. E. B. Katte remarked that the steam railroads have made considerable use of mechanical labor-saving devices for handling package freight. A disadvantage of the telepherage and similar transferring systems is found in the fact that the apparatus cannot be moved from place to place as freely as can the laborers who handle the freight on trucks.

Mr. H. M. Harding called attention to the fact that the cost of loading and unloading a barge is greater than that of towing the barge several hundred miles along a canal. An appreciable reduction in the cost of handling the freight means, therefore, a large decrease in the cost of transporting the material.

Telephone to Prevent Spreading of Forest Fires.

The State Forestry Department of Massachusetts is considering a plan for the establishment of observation stations at mountainous elevations to facilitate the discovery of fires and the protection of timber land and woodland growths. The State has been tentatively divided into five sections for this purpose, and each station will probably be equipped with a topographical map, range finder, telephone and other apparatus. Arrangements may be made at some places to use telephones already installed for private or semi-public parties, while in situations where no telephone service exists, the State is considering an appropriation for the installation of the necessary instruments. It is anticipated that by the use of the telephone from a station constantly manned during the dangerous season from March to October, incipient fires can be quickly extinguished and much more destruction prevented than where forest patrols are established and maintained in the lower levels of the country.

Revised Exterior Circuit Regulations for New York City.

Commissioner O'Brien, of the New York City Department of Water Supply, Gas and Electricity, which includes the electrical inspection service of the city, has announced the withdrawal of a rule relating to pole lines, which appears on page 21 of the printed electrical rules of the department, and reads as follows:

"25.—Conductors must not be placed upon fixtures erected or maintained for supporting wires of another class, except at crossings, when approved by said department."

For the above rule the following has been substituted:

"25*a*.—Electric light and power wires must not be placed on the same cross-arm with telegraph, telephone or similar wires, and when placed on the same pole with such wires the distance between the two inside pins of each cross-arm must not be less than 26 in.

"25*b*.—Electric light and power wires must not be placed on the same pole with telegraph, telephone or similar wires unless the former are placed above the latter and separated therefrom by a vertical distance of at least 4 ft., and where the voltage does not exceed the following operating values: Constant-

potential circuits, 5000 volts; alternating-current series circuits, 5000 volts; direct-current series circuits, 7500 volts; direct-current railway circuits, 700 volts.

"25*c*.—In the event of electric light or power wires passing down a pole carrying signal wires, the former must be enclosed in a grounded metallic covering and be suitably protected against mechanical injury, from the lowest electric light cross-arm to the ground or to a point 3 ft. from the center of the pole, measured horizontally.

"25*d*.—Mast arms and other conducting fixtures or rigging located below the lowest electric light and power cross-arm must be grounded. Transformer cases must be grounded unless the secondary circuits are grounded.

"25*e*.—Mast arms, etc., transformers with ungrounded secondaries, and shields for conductors running down the pole must be grounded at the pole to which they are attached, and messenger cables for electric light and power must be grounded at least every 500 ft., either by independent ground wires or by bonding to ground wires already in place.

"25*f*.—Transformers must not extend below, and cable boxes must not extend above, their respective cross-arms, unless the distance between the two groups of cross-arms be suitably increased."

Engineers Lacombe, Sever and Wynkoop, who have given the subject much attention in Brooklyn during the past four or five years and in Manhattan and the Bronx since the reorganization of a year ago, submitted the following report in connection with the recommendation for a change in the rule, which the commissioner has accepted:

"The old rule, the abandonment of which we are recommending, has been inherited from the Board of Electric Control and was undoubtedly appropriate to the wire conditions and to the state of the art at the time of its adoption. With the infinitely better construction which finds favor to-day, and with the gradual reducion of wire congestion on our principal highways, it is believed to be good policy to restrict the number of poles by requiring that all overhead conductors erected on any street be carried, so far as practicable, on one line of poles. It is believed also to be sound engineering to support upon one series of poles conductors for signaling and those for electric light and power, provided, first, that the signal wires, which are the less substantial, be placed underneath so that they may fall away from rather than upon the electric light and power wires; and, second, that the voltage of the electric light and power circuits be limited to the value which the consensus of electrical opinion throughout the country endorses for this situation.

"The policy of requiring grounded metallic coverings for wires carrying dangerous potentials when brought down within reach of the public or even within reach of the signal lineman, has met with some objections, either technical or financial, from the various electric companies in this city, but these alleged obstacles are not insurmountable, and, therefore, we believe should carry no weight where human life lies in the other side of the balance."

Brailey Telephone Properties.

More than 100 independent telephone men of Ohio met at the Chittenden Hotel, Columbus, on October 29 to discuss the recent change in the control of the United States Telephone Company and the Cuyahoga Telephone Company, and to take such steps as they believe will afford them protection in case the actual purchasers of these interests should be allied with the Bell Company in any way. While not contesting that James S. Brailey, Jr., head of the syndicate which purchased the Everett-Moore stock, is sincere in what he asserts, yet the lack of information in detail as to his associates is a matter which has disturbed them. Even with the situation as he states it, the control of the companies is with a new faction and the situation has changed materially through this step. To meet any conditions that may arise from that feature they have taken advantage of the opportunity to forestall any arrangement that will weaken them as a body against their competitors.

Mr. Brailey was in Columbus and attended some of the sessions. He reitereated his statements that neither he nor his associates were connected in any way with the Bell interests, and further asserted that the companies will remain independent, as there is no thought of allowing the control to go into other hands. He refused, however, to name his associates in the syndicate or give any details regarding the purchase of the stock. Mr. Brailey further said that he was not prepared at that time to make a statement as to the completion of negitiations for leasing the United States property to the Ohio Home Telephone Company, which was incorporated for that purpose just a few days previous to the announcement that he had secured control of the companies mentioned, as well as those at Indianapolis.

President Frank L. Beam, of the Ohio Independent Telephone Association, appointed a committee of 15 members to have charge of matters pertaining to the situation and from this number five were chosen to investigate the deal recently made. They are as follows: Messrs. Louis Brucker, Mansfield, chairman; H. M. Daugherty, Columbus; D. J. Cable, Lima; H. D. Critchfield, Chicago, and W. Guy Jones, Delaware. It is said that this committee has been authorized to bring proceedings under the anti-trust law if it develops that the Bell people have any interest in the control of the companies.

Mr. Herman C. Stifel, member of the board of directors of the United States Telephone Company and of the voting trustees of the Toledo Home Telephone Company, brought suit against the latter on Oct. 29 to require it to set a date upon which he may examine the books. He states that he is a stockholder and that, upon proper demand made the day previous, the company refused to allow him to see the books. He asks that the court enjoin the company from removing the books from its jurisdiction. On the same day Mr. Stifel brought suit in the courts of Marion County, Ind., praying for a writ of mandamus compelling the New Long Distance Telephone Company, of Indianapolis, to permit an inspection of its books.

President James S. Brailey, Jr., of the Toledo Home Telephone Company, stated that Mr. Stifel has had the company's monthly statements and could have had any further information he desires. He says he knows nothing further for the reason of the suit. Mr. Stifel is a broker of St. Louis and is prominent in the independent telephone movement. His attorneys would give no information regarding the matter.

Officials of the United States Telephone Company and the Cuyahoga Telephone Company, at Cleveland, state that they are not acquainted with any of the details of Mr. Brailey's plans. They say that he has told them that there will be no change in the policy of the companies and that they have every reason to believe all he says.

The organization of the Ohio Home Telephone has been completed by the election of a board of directors as follows: Messrs. Will Christy, Akron; S. W. Harper, Wheeling, W. Va.; W. F. Laubach, Akron; Harry M. Daugherty, Columbus, and B. G. Hubbell, Buffalo, N. Y. The directors organized by selecting the following officers: President, Mr. Will Christy, Akron; vice-president, Mr. S. W. Harper, Wheeling, W. Va.; secretary and treasurer, Mr. H. A. Hauxhurst, Cleveland.

The Inventors' League.

BY JOSEPH J. O'BRIEN,

General Secretary of Inventors' League.

It has been well said that the birth of the patent system marked one of the most important events in the history of mankind. That the patent system was conceived, in the rough, by the founders of the Republic, as a necessary measure to the development of native industries and national prosperity, is both a tribute to the foresight of these illustrious thinkers and an acknowledgment of the fundamental relation of security in property created by invention to national advancement. For years Congress proceeded in its work of forming and shaping laws of one kind or another before it finally

founded the present system of rights which rests on the issuance of patents for inventions. It was not till confusion had developed in the operation of the earlier patent laws that the essential features of the present system were incorporated into law.

While the theory of the present system of patent rights is admirable, the design of the system and the operation of patent laws are in constant and dangerous conflict with the interests which these laws were originally intended to protect. While industry has made wonderful progress because of the advances rendered possible through the patent system and the diffusion of knowledge, the patent system has not kept pace with the needs of the inventors, of the industries and of the nation. As a consequence there now exists a wide-spread unrest among the inventors and throughout the industrial fields respecting the present scope and operation of the patent laws, and there is a general agreement that inventors should unite in favor of the improvement of existing laws and methods.

In a world organized by invention the inventors are now the most isolated and disorganized class. Their grievances are in large part the indirect result of their helplessness, due to their present isolation. For years individuals have contended for improvement in the laws and methods of the patent system but with little or not result, and it is safe to assert that individuals may continue to contend as individuals for years to come and will achieve little of value. Organization is absolutely essential to a correct itemization of existing evils and needs; a correct definition of negative and positive causes; and the elaboration and successful promotion of an adequate program of revision and reformation. To provide the basis for an organization of inventors which would be at once free and properly limited to the vital needs of the inventors as a class, the Inventors' League has been organized.

The Inventors' League is the result of the earnest effort of inventors residing in the national capital to provide an organization which would be broad enough to include those inventors who were in favor of improving and protecting their interests, and narrow enough to exclude all who possessed interests conflicting with the interests of the inventors. Its membership is limited to three classes, as follows: Class A includes those who have secured patents in this country; the control of the League is in the hands of this class. Class B includes those who have filed applications in the Patent Office for patents, which class do not have the right to vote, but have a vote in the affairs of the League. Class C consists of inventors who have not filed applications, and are merely corresponding members. Practising patent attorneys, regular attorneys in practice, professional patent promoters, and employees of the Patent Office are not eligible to membership.

The constitution of the Inventors' League has been drawn with the object in view of providing an instrument whereby it would be impossible for the officers to "handle" the organization, but it would be possible for the organization to "handle" the officers. To this end a three-check system has been devised for the control of funds; the initiative and referendum have been included to provide for frequent general voting on all important questions and to provide adequate opportunity for the expression by the membership of organization and inventive needs, and for the improvement of the lines of organization; the recall has been included to prevent the abuse by the officers or servants of the organization of their positions; and the affairs and interests of the League have been distributed in such a way to bring out the best that can be secured and to afford adequate discussion and free and responsive action. When the League is not in session the Executive Council, of five members, acts for it. Five general committees are provided for, namely: Committee on legislation, consisting of ten or more members; Committee on the Patent Office, consisting of ten or more members; committee on foreign patent laws, consisting of five or more members; committee on assistance to inventors, consisting of ten or more members; committee of education and publicity, consisting of seven or more members.

These committees have not yet been named and will not be for some time yet, as it is the desire of the League to have its membership fully representative before the committees are filled. As the League is a national organization these committees will be selected from many States.

The objects of the Inventors' League are defined in the Constitution as follows:

"The intellectual and material advancement of inventors and the development of collective means for the protection of their rights.

"To secure a higher, more just and more practical realization of the constitutional foundation of the Patent System as set forth in the Constitution of the United States, as follows: 'The Congress shall have the power * * * to probate the progress of science and the useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries.'

"To secure closer co-operation between inventors for their mutual protection, without loss of their independence.

"To secure adequate provision for the just and effective consideration of new inventions and the safe keeping of the priceless records of invention.

"To facilitate the development, advancement and utilization of inventions by the extension of existing opportunities and by the diffusion of facts among the inventors and the people, concerning the vital importance of the rights of inventors, and by the encouragement of awards and similar measures for new inventions.

"To discover and define opportunities for the application of inventions and to bring inventors into closer and freer relations with such opportunities.

"To collect and preserve the history of inventive achievements and the literature of invention."

From the foregoing it will be seen that the Inventors' League is committed to a program designed to render property in inventions more secure and to improve and protect the interests of inventors.

The League has opened a headquarters in the Munsey Building, Washington, D. C., and is now at work completing plans for the publication of a monthly journal to be devoted to its work and the interests of inventors. In order to keep the League out of purely commercial work, and thereby consistently true to its mission, the constitution prevents it entering into any commercial pursuits or endorsing any one engaged in such pursuits.

The initiation fee has been placed at $1 and the dues at $4 a year, or $1 a quarter. The journal to be soon published by the League will be furnished free to all members. Its policy will be consistent with the interests of the inventors as a class. It will be of all things a paper advocating their interests and serving them along such lines as do not conflict with the foregoing objects.

Following are the present officers of the Inventors' League: Mr. William P. Armstrong, president; Mr. George W. Bartlett, first vice-president; Mr. O. H. de Lamorton, second vice-president; Mr. Joseph J. O'Brien, general secretary; Mr. C. E. Phillips, financial secretary; Mr. J. R. Kelly, treasurer.

The Inventors' League is the first organization conceived by inventors; shaped for the advancement of inventors by inventors, and controlled by inventors in the interest of inventors as a class. The earnest co-operation of all inventors is asked that the work of improvement can be carried on with the best and surest success.

Locomotive for Pennsylvania Tunnel.

Beginning on Oct. 29 the Pennsylvania Railroad Company has been testing on the Long Island Division the first of the electric locomotives to be used in the New York tunnel extension. This locomotive is one of 24 to be assembled at the Altoona shops, where the mechanical details were built; the electrical apparatus was constructed at the East Pittsburgh

shops of the Westinghouse Electric & Manufacturing Company.

As seen from the accompanying illustrations, the locomotive is built in two sections, there being two cabs and two running gears, jointed at the middle. Each section has eight wheels, four of which are 68-in. drivers, the other four being 36-in. truck wheels. The sections are permanently coupled back to back by friction draft gear and levers, so that the leading section pilots the rear one. All of the manipulating levers are

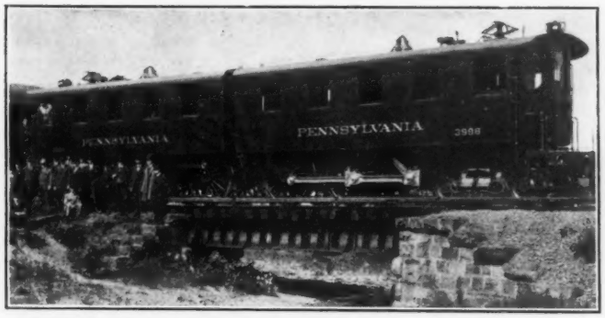


FIG. 1.—LOCOMOTIVE FOR PENNSYLVANIA NEW YORK TUNNELS.

duplicated in each section and hence the locomotive need not be turned at the end of a run.

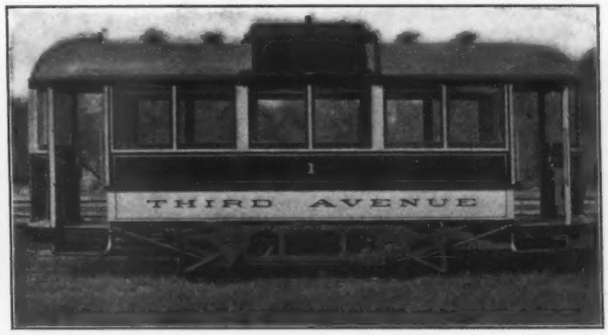
Each motor is provided with two cranks, one on either end of its shaft, placed 90 deg. apart. By means of coupling rods the motor delivers all of its power to a crank-shaft in line with the driver axles to which it is coupled. The arrangement is such that the torque on the drivers is constant throughout each revolution. It is said that the height of the center of gravity closely approximates that in the best high-speed steam locomotives. All of the gearing mechanism is spring supported from the driver and truck wheels.

Each motor weighs, without gearing, 45,000 lb., and is rated at 2000 hp. The total weight of the locomotive is 166 tons, the electrical parts weighing 62 tons. The maximum draw-bar pull for the two motors is 60,000 lb.; a speed of 70 miles per hour can be reached under load on level track. The total length of the locomotive is 65 ft.

A large part of each cab is filled by the motor. In a bulkhead sort of an arrangement centrally located in the cab is the main control apparatus, while at one end is located the electrically driven air-compressor for operating the brakes. The switching operations are performed by electro-pneumatic devices, the movements of which are governed by a miniature master controller. The locomotive is equipped with third-rail collector shoes for normal service, but is provided with an overhead contact mechanism for use where a third-rail cannot be installed.

Gasoline-Electric Car for New York Service.

A single-truck car, similar in external appearance to the ordinary electric car, but containing its own generating station, has been built by the General Electric Company for the Third Avenue Railroad Company of New York. The propelling equipment consists of two motors mounted on the axles in the



GASOLINE ELECTRIC CAR FOR NEW YORK.

usual manner. These motors receive energy from a generator directly connected to, and totally enclosed with, a gasoline engine of the four-cylinder, four-stroke-cycle type. Controllers at each end of the car allow it to be operated in either direction as desired. The controllers connect the motors progressively in series and in parallel, and regulate the voltage supplied to the generators, as required by the speed of the car. In this way all mechanical connections between the gas engine and the driving axle are eliminated. The gas engine, provided with automatic centrifugal-throttle governor, runs at constant speed regardless of the speed of the car, and thus operates at all times at high efficiency.

A Bosch low-tension magneto supplies energy for the ignition system, which is of the "make-and-break" magnet plug type. A directly-connected exciter supplies energy, not only for the field circuit of the main generator, but also for the car lighting.

The car has no monitor, its roof being dome-shaped with suction ventilators. Water-cooling radiators are placed on the roof over the center of the car and are connected to the water jackets of the cylinders by pipes enclosed within the center posts of the car. The circulation is semi-siphon.

The over-all length of the car is 28 ft. It is provided with seats for 26 persons and weighs 12 tons when completely equipped. The truck is of special light construction of riveted plate frame, equipped with Hess-Bright ball-bearing journal boxes. The truck frame is supported on coil springs and is steadied at the ends by half-elliptic springs.

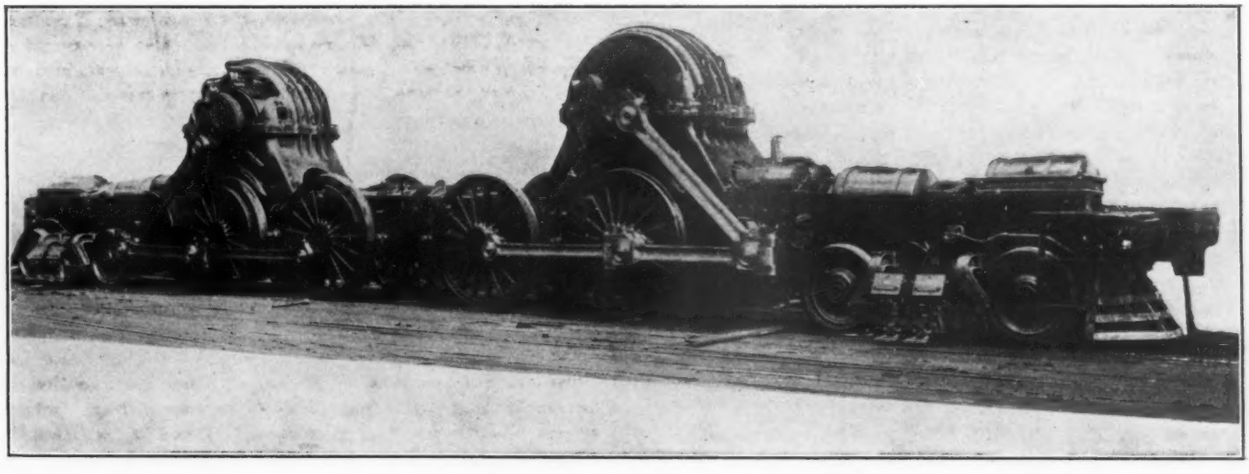


FIG. 2.—CHASSIS OF PENNSYLVANIA RAILROAD LOCOMOTIVE.

Western Association of Electrical Inspectors.

The Western Association of Electrical Inspectors held its fifth annual meeting in Detroit, Mich., on Oct. 26, 27 and 28. The report of the secretary showed that there are now 187 members, of whom 15 were added during the past year. The registration at the meeting was 35.

A committee, of which Mr. Frank R. Daniel was chairman, submitted a report on the grounding of conductors for safety which produced considerable discussion. The main point at issue was the advisability of grounding the exterior casing of all fire and police telegraph alarm boxes. The objections urged were based on the facts that some of the boxes were not designed to permit grounding without injury to the service and that many burnouts in these boxes were directly traceable to the ground connection. A committee was appointed to investigate the problem and determine the best method of handling it. The association decided that ground rods driven into the earth as usually installed do not form reliable ground connections and should be condemned or improved by the addition of more surface area and greater length of pipe to insure the penetration of the permanent moisture level.

The proposition to provide a surface ground, as well as a permanent ground by means of one plate embedded in coke below the permanent moisture level connected with one embedded in coke 8 in. below the surface of the earth, started a general discussion. It was decided that this question could not be disposed of and was referred back to the committee for further investigation.

Tours of inspection were made, including visits to a theater wiring installation, the storage battery auxiliary supplying energy for emergency purposes and the sprinkler supervisory system of the Still Alarm Company. Later visits were made to the factories of the Detroit Fuse and Manufacturing Company, where the manufacture of fuses was exhibited; the Detroit Insulated Wire Company, where was witnessed the process of insulating wire with rubber, and the American Electric Heater Company, where the manufacture of electric heating apparatus was exhibited.

PUBLIC SAFETY.

In a report on public safety in relation to fire prevention, submitted by a committee of which Mr. W. J. Canada was chairman, it was stated that hundreds of fires within the past four years have been traced to primary voltage reaching secondary circuits, and that, therefore, there is a close relation between fire and life hazards and there exists a necessity for recognizing both in any treatment of the subject. The suggestion of the committee to abolish brass-shell sockets and flexible cords in rooms having stoves, bath-tubs, sinks, damp floors and the like, was adopted as a recommendation, but not to be treated as mandatory. It was recommended also that knob and tube construction be replaced wherever possible with conduit.

Following an informal dinner at the Log Cabin Inn, Mr. James E. Cole delivered an illustrated lecture covering the history of the wiring troubles in Boston and describing the methods employed for eliminating them. Mr. Alexander Henderson discussed the effect of inspection on the manufacture of electrical appliances. He advocated rigid inspection, uniform rules and co-operation with manufacturers who are trying to produce safe appliances. In an address on the technical press and its relation to electrical inspection work, Mr. J. B. McCarthy entered a plea for the gathering of data relating to fires of electrical origin for publication in the technical press. Mr. H. C. Harris asked for patience on the part of inspectors toward the developments in installations made in connection with the improved lighting equipments. A discussion of metal molding brought out the fact that this type of molding has proved satisfactory and will in time supersede wood molding. The desired fittings are gradually being developed for all classes of work.

The report of a committee on architects' specifications gave specifications covering installations for residences and bank buildings and work condemned by the Underwriters. This report was not adopted on account of the prevailing belief that form specifications are unwise.

"Instructions to the Public Concerning the Safe Operation and Maintenance of Electric Wiring and Apparatus" was the subject of a report of a committee of which Mr. T. D. McColl was chairman. The committee recommended that every effort be made by inspectors to create in the minds of the public a proper recognition of the fact that electrical construction requires skilled work and cannot be done by the "jack-at-all-trades." The instructions offered covered electric lamps, motors and smoothing-irons.

Mr. Charles W. Arrick, as chairman, submitted the report of the committee on installation and operation of induction motors, which asked for the discussion of various points. In the discussion it was held that the resistance type of starter is not so good as the impedance type. The use of an outside oil switch on high-potential installations was advocated. No mandatory action was attempted on this report, and the committee was instructed to pursue further investigation.

The committee on construction and installation of electric signs, of which Mr. Emil Anderson was chairman, submitted certain questions for answers by the members. The answers indicated that low-voltage lamps give good service. It was suggested that copper shells be required on sockets and receptacles exposed to the weather, and that signs be so suspended as not to come into contact with wires used for other services; the method of suspension being governed by published rules.

Illumination by means of reflected light was stated to be the standard for show windows in a report of the committee on show-window and display lighting, of which Mr. Fergus P. McGough was chairman. For such installations conduits and metal moldings are preferable to wooden moldings and are not materially more expensive.

Discussion of difficulties arising in electrical inspection work brought out several good points. Much time was devoted to packing-house, brewery and malt-house wiring, and several types of construction were described. The use of inverted troughing in excessively damp places with glass insulators was recommended, but where vapors or injurious solutions of any sort are present the rubber insulation should be protected by a lead covering supported on porcelain cleats. The lead covering should be broken at intervals to clear any grounding contacts. At these breaks the wire and lead covering should be heavily taped and carefully painted. Conduit work was recommended for wiring in the ordinary damp place.

The following officers were elected for one year: President, Mr. Fred G. Dustin, Minneapolis, Minn.; first vice-president, Mr. W. J. Gilsdorf, Lexington, Ky.; second vice-president, Mr. H. G. Young, Streator, Ill.; secretary and treasurer, Mr. William S. Boyd, Chicago, Ill.

The next meeting will be held in Omaha, Neb., in October, 1910.

Electrical Securities as Investments.

An instructive talk was given before the Electric Club of Chicago at the weekly luncheon of Oct. 27, by Mr. George B. Caldwell, manager of the bond department of the American Trust and Savings Bank, whose subject was "Electrical Securities as Investments." Mr. Caldwell mentioned four elements as essential features of a marketable bond on an electrical plant. First, the property must not be overbonded; second, it must have good management; third, it must have a depreciation reserve or sinking fund, and fourth, there must be honest accounting. It is important to remember that the investor seeks security first, income second and convertibility third. This is the case with the securities of all corporations.

In the case of electrical properties the feeling exists that electricity has not yet been fully developed and that the methods employed for its production and distribution are rapidly changing. It is sometimes objected that electrical apparatus has not

become standardized as yet, and that therefore there is additional risk—a sort of double depreciation. But Mr. Caldwell's own observation is that standard apparatus is now to be had for electric light and power and that it furnishes a safe business risk for a 15-year or 20-year bond. But it is important that tests of the durability and productive power of modern electrical plants should be clearly and conservatively determined, and the facts freely published, if securities are to be sold to the public.

Referring to a proper depreciation charge, the speaker noted that this item has been very large, but he remarked that it will grow to be less of a hazard, especially with standard machinery. It is contended nowadays that where a property is kept up to a high state of efficiency a depreciation charge of perhaps 5 per cent, or at most 7 per cent, will keep the security good. If this is true, electrical securities are as good as those of any other industrial enterprises and compare favorably with the depreciation account on city real estate. An electrical property costing $250,000 must earn $25,000 a year above operating expenses to care for a 5-per-cent depreciation and pay 5 per cent on the money invested. Such an earning power does not, however, justify a bond issue for more than one-half of the investment, and then only where the franchise situation and management are of the best and the public is a ready consumer.

Considering the marketability of electrical securities, the speaker noted the large number of small central stations and said that it is obvious that one must have very specialized information to be a judge of the character of these thousands of different issues of bonds and stocks. Bond issues on these properties bear 5 or 6 per cent. Even though conservative, they lack in convertibility, which is another word for marketability. It is probable that within a few years there will be consolidations of many small properties, correcting operating evils and broadening the market. At present the market for securities of plants in cities of 10,000 to 20,000 population is slow and doubtful, even though the margin of security is ample. If sold at all, the discount is heavy and money secured in this manner frequently costs from 8 to 10 per cent. The remedy for this situation seems to lie in the operating company with capital sufficient to handle many small "situations" economically.

But the speaker was willing to concede that the business of manufacturing and selling electricity has been almost uniformly profitable. He regards a bond issue on a modern electric-light plant in cities of 50,000 and over as only an ordinary business hazard. For such a hazard 5 per cent on a bond issue for not over one-half the cost, with sinking-fund provision, makes a safe investment provided the net earning power averages twice the interest. With the questions of management and marketability worked out, as they surely will be—the first by honest engineering and the latter by honest financing—the investing public will have less cause for apprehension. Markets will broaden and prices improve.

Competition in electric service is not desirable. Fair treatment to the public should be obtained by regulation of rates and service in the hands of fair-minded public-service commissions. It is good business policy to give the customers good service at reasonable cost. Given intelligent technical management, conservative accounting and a liberal interpretation of consumers' rights, Mr. Caldwell sees no reason why funds will not be found that will absorb all the electrical securities which it may be found necessary to create.

The speaker, in answer to a question from Mr. F. P. Vose, gave an interesting account of the procedure followed when an electrical operating man comes to a banker or bond house to secure funds. The first inquiry is whether the proposition offered is genuine or a fantasy. The physical characteristics of the plant or plants under consideration are considered; also the franchise and management. The banker gets all the facts available and then asks the applicant what he wants so much money for. The latter usually explains that he wants to make large extensions and improvements for the future. Perhaps his ideas are visionary; he may be over-enthusiastic by reason of local pride. It may be necessary to cut out certain things. The applicant is asked: "What have you got as a basis for credit? What is the earning power of the property? What will be its future earning power?" Often the visitor can make only vague answers to these inquiries.

If the conversation goes so far, the terms of the mortgage are next taken up, and what is offered to the applicant may be unsatisfactory to him. Perhaps he will go away and make the round of the bond houses, coming back after a while to resume the negotiation. If the proposition is at all interesting, the banker or dealer in bonds will demand reports on the situation and property from an engineer and an accountant to be nominated by the banker, but to be paid by the applicant for the money. Having received these reports, the banker makes his final decision. If he goes ahead with the bond issue the question of a market comes up. All the banker's deposits could be put out in unmarketable securities, but a due regard for the depositors' money makes this impossible; the securities must be marketable; they must be an element of strength and not of danger. If satisfied on this point the bank will be willing to develop the enterprise for the commissions and profits which it receives from the transaction.

The great question is, Can the bonds be sold? When the question of rehabilitating a small run-down property in a small city comes up it may be better for the men in charge to go to a large operating company and interest that company in the re-equipment of the property rather than offer bonds on the individual property to a bond house. The question of earnings is only a part of the problem. More important is the situation and management of the property. Troubles and losses in small stations come usually from poor management. Thus the security may be intrinsically good, but the management may change hands; poor management may ruin a good property. This question of management is vital. The management should be intelligent and tactful. The bank is very sensitive about the character of the investments on which it sells bonds, for its customers must have a complete sense of security in bonds purchased. The bank recommends the securities and must watch the management of the property closely. The question of marketability of electrical securities is going to right itself, but the matter of the security involved must always rest on good judgment.

The basis of financing electrical properties of small size must be that the local people have a substantial stock interest. Nobody should borrow all the money he does business on. Real estate loans, for instance, are made on a basis of 40 or 50 per cent of the value of the property. It is inconsistent with conservative finance for a man to attempt to sell an electrical property to the public and still own it himself. Stake your own money with that of the bank. The applicant will receive careful attention if the security offered and the management of the property are right; the bank will take care of the marketability.

In the discussion Mr. George Cutter, of South Bend, Ind., alluded to the conspicuous improvement in industrial business. Certain classes of machine tools, for instance, have increased 20 per cent in price within the last few months and deliveries are not to be had in less than a year's time.

Mr. F. J. Postel questioned Mr. Caldwell in relation to the responsibility of trustees for bond issues so far as protection to the bondholders is concerned. The answer was that the greatest protection of buyers of bonds is the character of the house dealing in them. However, according to the usual practice, if there is a default in interest the holders of 25 per cent of the bonds may combine and petition for a receiver or other relief.

Mr. George H. Lukes asked why a greater number of bonds of less than $1,000 denomination were not issued. He pointed out that local people of small means might buy bonds if they were not required to invest as much as $1,000. Mr. Caldwell said that this was a good point. The principal objection to small bonds on the part of banks and dealers is simply one of physical quantity; the greater number becomes cumbersome and are burdensome on vault space. There appears to be no other

objection to small size from the bank's point of view. In cases where bonds of $1,000, $500 and $100 have been issued, it has been almost invariably the case that the $100 bonds sold first. The farther you get away from the commercial centers, the smaller are the investors, and the securities should be suitable to the locality in which they are sold. This matter can be handled as the borrower wishes.

Illinois State Electric Association Convention.

The Illinois State Electric Association held its annual convention at Alton, Ill., Oct. 26, 27 and 28, 1909. This was by far the most successful convention ever held by the association as regards attendance, the registration showing 104 central-station operating men in attendance. The first session was scheduled for the afternoon of the 26th, but owing to the delay in the arrival of a special car over the Illinois Traction System, which brought a large number of delegates, no session was held until the morning of the 27th. About 3:30 p. m. a visit was made to the large plant of the Illinois Glass works. In the evening a smoker was given at the Elks Club by the supply men. The entertainments provided by the supply companies were managed by Mr. W. R. Pinckard, of the Westinghouse Chicago office.

The first session was called to order in the council chamber of the city hall Oct. 27, with President F. M. Sinsabaugh, of Carrollton, in the chair. The report of Mr. David Davis, of Litchfield, chairman of the committee on membership, showed 11 central stations as recently joining the association. The president appointed as a committee on resolutions Messrs. Frank J. Baker, of Chicago; R. H. Abbott, of Petersburg, and H. A. Foster, of Fairbury.

"Lighting Rates in Small Towns" was the subject of a paper by Mr. W. J. Whetzel, of the Eureka Electric Service Company, Eureka, Ill. A paper on "Lighting Rates in Towns of over 15,000 Population" was read by Mr. M. G. Linn, of the Bloomington & Normal Railway & Light Company, Bloomington, Ill. These drew out a long discussion, as is usual when rate questions are brought up at conventions of this kind. After some discussion of this subject it was voted to appoint a committee of five to make a report and recommendations to the next convention as to proper methods of arriving at rates and systems of charging for electricity. The object of appointing this committee is not to have it recommend specific figures or rates, because these rates necessarily should vary according to the cost of production in different towns, but rather to recommend certain standard methods of arriving at rates, so that the smaller companies seeking for light on this subject may have something to guide them. This committee on rates, which was appointed by the president at the morning session the next day, consists of Messrs. R. S. Wallace, superintendent of the Peoria Gas & Electric Company; G. W. Burton, of Danville, attorney for the Illinois Traction System; S. B. Cushing, of the North Shore Electric Company, Evanston; J. J. Frey, secretary and manager of the Hillsboro Electric Light & Power Company, and E. L. Brown, owner of the Elmwood electric light plant.

From the question of rates the convention drifted into the subject of requiring a deposit from new consumers or requiring the signature of some property owner to an application for service. The opinions of members seemed to be divided on this subject, but several from the larger companies expressed disapproval of requiring such deposits except in a few cases where credit was known to be bad. This disapproval was based on the bad effect on the new customer and on the public in general of acting as if every new consumer were a suspicious character.

Wednesday afternoon the session was opened in the lodge room of the Elks Club. Mr. H. W. Dickerman, of Rockford, Ill., presented a paper on "The Relation of the Electric Vehicle to the Central Station." Following this several members gave their experience with electric automobiles. Outside of Rockford and Chicago no great amount of progress with electric vehicles was evident, but many managers expressed interest in the electric vehicle and the intention to cultivate this business.

A talk on "Gasoline Lighting" was given by Mr. David Davis, of the Litchfield Gas & Electric Company. The discussion which followed indicated that a few companies were having considerable trouble with gasoline competition, and with others this has ceased to be a very live issue because of the advent of the tungsten lamp and proper systems of charging for electricity.

Mr. C. A. Howe, of the Holophane Company, gave a brief talk on "The Doing and Undoing of the Watt." He described briefly and plainly the simple method of estimating the watts per square foot required to produce a given illumination with fair approximation, from tables compiled by Cravath and Lansingh. In general, he did not approve of what he called the "anti-wattage" engineer, whose only object is to reduce the wattage required to light a given area. He believed rather in an increase of the general standards of illumination. The tungsten lamp is a help rather than a detriment to the central station, and the companies which were most afraid of introducing tungsten lamps are now the ones having the most trouble with gasoline plants.

The president appointed a nominating committee, consisting of Messrs. J. G. Learned, North Shore Electric Company, Chicago; R. L. Bivans, of the Jerseyville Illuminating Company, and W. H. Brown, of the Peoria Gas & Electric Company.

Wednesday evening the association members were guests of the supply men at the Temple Theater, where a concert was given by the Walter Damrosch Orchestra. After the concert the Sons of Jove held a rejuvenation at the Elks Club.

Thursday morning resolutions of regret were presented on the death of Mr. A. V. Schroeder, formerly superintendent of the Springfield Light, Heat & Power Company, and at one time active in the association. Resolutions of thanks were passed to the Alton Railway, Gas & Electric Company, and especially to the manager, Mr. O. C. Macy, and to the supply men, for the entertainment provided; also to the Elks Club for the use of its clubhouse for the meetings and smoker, and to the Illinois Glass Company, whose works were visited.

A paper on "Power," by F. H. Golding, manager of the Rockford Electric Company, was presented. The discussion on this centered about the question of rates and methods of determining the consumer's maximum demand, and also the subject of installing motors on trial as a quiet way of answering all arguments and getting the motors introduced.

Mr. John G. Learned, of the North Shore Electric Company, Chicago, presented a paper on "The Advantages of the Tungsten Lamp," which was discussed briefly, no dissenters being found from the sentiment that the tungsten lamp has been found a great boon to the electric lighting industry.

The convention went into executive session and passed an amendment to the by-laws whereby the annual dues are graded according to the population of the town in which the member company is doing business.

Officers elected for the ensuing year upon recommendation of the nominating committee are as follows: President, Mr. E. W. Smith, manager of the Kewanee Light & Power Company; first vice-president, Mr. W. G. Austin, secretary and manager of the Effingham Electric Light & Power Company; second vice-president, Mr. H. A. Foster, secretary and manager of the Fairbury Electric Light, Heat & Power Company; third vice-president, Mr. A. R. Manley, superintendent of the Mount Carmel Gas & Electric Company; fourth vice-president, Mr. F. H. Golding, manager of the Rockford Electric Company; treasurer, Mr. E. McDonald; secretary, Mr. H. E. Chubbuck, general manager, Illinois Traction System, Peoria, Ill.; assistant secretary, Mr. C. A. Willoughby, Illinois Traction System, Peoria; executive committee: Messrs. W. B. McKinley, president of the Illinois Traction System; F. J. Baker, general manager of the North Shore Electric Company; E. G. Schmidt, manager of the electric lighting companies of Spring-

field and Peoria; F. M. Sinsabaugh, of Carrollton, and David Davis, manager of the Litchfield Gas & Electric Company.

Thursday afternoon the convention was taken by two special cars to the power house of the East St. Louis & Suburban Company, which supplies the companies operating railway and lighting service over a large territory in the vicinity of East St. Louis. This power house is interesting as having one of the largest installations of cooling towers for condensing water in the country. The plant contains both high and low-pressure steam turbines and engines, the low-pressure turbines being operated between the exhausts of the engines and the condensers. The cooling towers are of the steel-encased stack type, with forced circulation and ventilation.

Mr. E. W. Smith, president-elect of the association, is manager of the Kewanee Light & Power Company and of the Kewanee Gas Light & Coke Company, which position he has held for two and one-half years. Mr. Smith is 37 years of age, and has lived at Kewanee 18 years. He gathered his electrical experience with the old electric lighting company at Kewanee. For a time he was in the employ of the large steel tube works at that place, later returning to the electric lighting property, where he was general superintendent for several years. This is one of the properties controlled by the American Gas Company, of Philadelphia.

Abstracts of the papers and discussions will appear in later issues.

Annual Dinner of Commonwealth Edison N. E. L. A. Branch.

The second annual dinner of the Commonwealth Edison branch in Chicago of the National Electric Light Association was held at the Lexington Hotel on the evening of Oct. 28. It was a carefully arranged, well-appointed dinner, with speeches of exceptional value, and was a highly satisfactory affair in every way to the 235 gentlemen who were present. The chairman of the branch, Mr. George Harvey Jones, presided, and the toastmaster was Mr. Louis A. Ferguson, vice-president of the Commonwealth Edison Company and a past-president of the National Electric Light Association. There were two other speakers, Mr. Frank W. Frueauff, New York, president of the National Electric Light Association, and Mr. Samuel Insull, president of the Commonwealth Edison Company and a past-president of the National Electric Light Association. There was some excellent singing by the Weber Quartette.

At the conclusion of the dinner all present were given an opportunity to shake hands with Mr. Frueauff, who came from New York simply to attend this dinner. Mr. Jones opened the speechmaking by reviewing the history of the branch during the year. As it was the last meeting of his administration he also announced the appointment of a nominating committee, consisting of Messrs. E. W. Lloyd, W. L. Abbott and J. H. Goehst. He then surrendered the direction of affairs into the hands of Mr. Ferguson, who introduced Mr. Frueauff by referring, among other things, to the remarkably successful career of that gentleman.

After alluding pleasantly to the work of a Commonwealth Edison man in saving the day for the West at the memorable baseball game at the Atlantic City convention last June, Mr. Frueauff spoke of the work which the National Electric Light Association has under way. He referred particularly to the new features, as the appointment of an executive secretary, the preparation of a table of electrical values for use in school books and the standardization of the vocabulary of electrical terms.

In his introduction of Mr. Insull, Mr. Ferguson gave some figures showing the work accomplished by that gentleman in the electrical field in Chicago and vicinity which were of much interest. He said for one thing that when Mr. Insull took hold of the company in 1892 its income was $350,000 a year, while now it is about $10,000,000 a year.

Mr. Insull was in a particularly happy vein and he spoke to his associates and assistants for three-quarters of an hour in a most earnest and helpful spirit. His address made a deep impression. He told of his early association with Edison and the great man's abiding faith in the future of the electrical industry. He said that there is more of a chance for the young electrical man to-day than there was even at the beginning of the art of electrical illumination a quarter of a century ago. The way for the young man to get on is to keep his eyes open and to know why things are done. The speaker dwelt on the great field for electrical service in Chicago and also emphasized the necessity of treating customers with unfailing courtesy and tact.

Mr. Ferguson, Mr. Frueauff and Mr. Insull were enthusiastically applauded and their remarks were listened to with careful attention. Those present departed with the feeling that the dinner had been indeed a noteworthy affair.

Meeting of Electrical Section of Canadian Society of Civil Engineers.

The Electrical Section of the Canadian Society of Civil Engineers held its first meeting for the year on Thursday evening, Oct. 28, in the auditorium of the Society at Montreal, Canada. Prof. L. A. Herdt, chairman of the section, made a brief address setting forth the necessity of all the members interesting themselves in the work of the society. Mr. E. I. Wenger then read a paper on the "Determination of Train Resistance." This paper was very instructive and contained an excellent outline on the work done by different commissions, companies and universities on this determination. The paper was fully discussed by a number of engineers present, the attendance at the meeting being exceptionally good, about 100 members being present.

Hearing on Franchise of Economic Company.

The hearing on the application of the Economic Power & Construction Company for approval of its franchises and construction at Geneva, N. Y., was resumed by the New York Public Service Commission, Second District, at Geneva, on Sept. 23. Chairman Stevens presided. An account of the previous hearing was published in the issue of Sept. 16, 1909, page 645.

Mr. J. A. Bendure, general manager of the Economic company, was recalled for direct examination by Mr. Herbert P. Bissell, counsel for the company. Mr. Bendure testified that the electrical service in Geneva before the Economic company purchased the property of the Geneva Steam Heating Company was poor and that he believed a good opportunity existed for another company to do electric lighting business in Geneva. There would be advantages in combining steam-heating service with electric light. Mr. Bendure had had experience with combination plants in various cities and testified that the current was generally furnished for less and the steam heating was furnished for less. The witness testified that 76 or 78 merchants were supplied for commercial purposes. The company did not enter the residence districts.

Various residents of Geneva who were using the service of the Economic company were called as witnesses in its behalf.

Mr. W. Marvin Rogers, city clerk of Geneva, testified that he had not found, in the original record book of the city or the village which preceded it, any record of any grant or franchise to the Geneva-Seneca company or its predecessor corporation, to use public streets. The first mention he had found was of a regular meeting of the board of trustees in the village of Geneva on Feb. 19, 1884, when a resolution was passed giving the Brush-Swan Electric Light Company the power to install poles for the purpose of carrying wires to furnish electric light. Mr. L. E. Carr suggested that a petition had been presented to

the board on Feb. 2, 1884, and this was confirmed and read by Mr. Rogers, who also referred to the various other entries relating to agreements between the company and the village or city subsequent to that time.

Mr. Bissell said that these entries were made to show that the Geneva-Seneca Electric Company had no right to be in the streets and that under the charter provisions of earlier years the right could not be granted for an indefinite period. There was a gap of seven years for which Mr. Rogers had no books on file in his office. He had no information as to the whereabouts of the village records during that period.

Mr. L. E. Carr stated that the contention of the Geneva-Seneca company was that the petition presented in 1884 and the resolution passed at that time were sufficient permission for the company to secure use of the streets, install poles and string wires and that the action of the company in this matter had been recognized by the municipal authorities for the ensuing 25 years.

Mayor Arthur P. Rose, of Geneva, was introduced as a witness on behalf of the Economic company, and was cross-examined by the attorneys. Chairman Stevens inquired whether the witness had had any experience as to how long competition would continue between two rival companies and whether he had known of any instance where such competition had existed. Mayor Rose had had no experiences of this nature. Chairman Stevens asked whether there was any requirement of the charter or any agreement by which competition must be maintained between the two companies. There was none to Mayor Rose's knowledge. In response to another question, the witness stated that he did not know whether the gross revenues of the companies were sufficient to make any return upon the capital invested in the two plants. Chairman Stevens asked what would happen if there was not sufficient business in Geneva to pay any dividends upon the capital investment in the plants. The Mayor supposed that receivership would follow and that unquestionably in that case one company would operate the entire property eventually.

Mr. Bissell introduced in evidence a general release to the Economic Power & Construction Company from the mortgage of the New York Power & Securities Company covering this plant. That release had been recorded. The chairman had called attention at the last hearing in Albany to the fact that the commission desired to protect the public by having a value in the plant, which had already been encumbered by an issue of bonds and was then encumbered by a further mortgage to the New York Power & Securities Company. The latter mortgage, which had been upon the real, personal and franchises and property of every name and nature, had therefore been released, leaving the plant encumbered only by the mortgages securing $30,000 of bonds, and by a $4,000 underlying mortgage on the lot where the plant was built. The $30,000 of bonds were issued by the Geneva Steam Heating Company under two mortgages, first and second; one of $20,000 and the other of $10,000. Mr. Bissell said that it was intended to release the property entirely from all indebtedness to the New York Power & Securities Company so as to leave it free and clear in order to answer the requirements of the commission.

Mr. L. E. Carr made public a statement signed by 78 of the customers of the Geneva-Seneca company stating that the service of the company was entirely satisfactory. Chairman Stevens thought that no statement which covered a period of time as to which evidence had been given of improper or insufficient service ought to be received. The witnesses ought to be heard on that subject. So far as the present service was concerned, he saw no objection to receiving the statement in view of the evidence.

Mr. Bissell objected to the introduction of any paper of that character. Chairman Stevens said that no evidence had come to his attention where any witness had sworn that the service of the Geneva-Seneca company in 1909 was in any way unsatisfactory. If there was any, he had overlooked it. The evidence that had been given of unsatisfactory service covered a period up to the time when the Economic company entered.

Mr. L. E. Carr wanted to be sure that he was not mistaken on that point because in the decision of the commission in the Niagara Falls case, where it was a fact that the existing company was affording reasonably good service, that was held to be an answer to the petition of a new company seeking to enter in order that it might compete. It seemed to him that the Geneva-Seneca company had met the public needs.

Chairman Stevens said that the situation was radically different from what it was in Niagara Falls. In Niagara Falls an entirely new company which was not in service was involved. In Geneva the company was actually doing business. It alleged that the service was not what it should be and the rates not what they should be and that under the spur of competition the services had been improved and brought to a point where no evidence was offered that the old company was not performing its duty now. The Economic company said it entered because it believed it had a legal right to do so based upon the judgment of the Supreme Court. It was a fair proposition, but it turned out by virtue of a decision of the Court of Appeals that the company had no legal right in Geneva at the present time.

Patrons of the Geneva-Seneca Electric Company testified on Sept. 24 regarding its service.

Mr. F. N. Lawton, manager of the Geneva-Seneca Electric Company, was called as a witness. He said that about 50 consumers of the Geneva-Seneca company went over to the Economic company. The Geneva-Seneca company had added 72 customers since the beginning of 1909.

Mr. F. L. Dame, electrical engineer, testified that he had been managing or supervising the management of electric light plants since 1891, but that he did not know of any city in the United States of the size of Geneva where there were two competing companies at the present time. He had known of a number of small cities where two companies had operated for a time, and a consolidation of the properties had followed invariably. But competition of this nature had resulted in ruinous rates for each company, in the destruction of business, a loss for each company and an unnecessary duplication of investment. He did not know of any situation where competition had been eliminated by combination where the rates formerly in force had been continued, unless possibly in the instance of Lockport, N. Y., where the commission prescribed the retention of the existing rates.

The Geneva-Seneca company had ample station capacity in Geneva to-day to handle the entire lighting of Geneva, Waterloo and Seneca Falls, and the lines in Geneva had been extended as fast as the necessity existed for the service. The conditions in Geneva respecting the extension of the facilities were about what existed normally in the development of electric light properties. There was absolutely no necessity for the existence of a competitive company. The character of service during the last three or four years had been as good as was usually found in places of the size of Geneva. The plant in a city of that size was not likely to have the most modern direct-connected units, particularly where there had been an electric lighting plant in the earlier days. The company had not felt that the business justified further expenditures than it was making and the business was never sufficiently prosperous to justify dividends. The new station had the most modern type of machinery that could be installed. The old station, which was used in the day for service and for reserve, had practically the same class of machinery as the Economic company was operating, but of greater capacity.

Mr. Dame testified that the statement made in relation to the supposed economy from combination of the electric lighting and the steam-heating business was true when the loads balanced in the two systems, but it may cost more to produce electric light in connection with the heating system in an unbalanced system than if the same machinery should be operated independently of the heating system, for the reason that the heating system required a pressure of circulating steam, and his experience in the smaller communities had been that the pressure was generally rather high. After cross-examination by Mr. Bissell, it

was testified by Mr. Dame that the Geneva-Seneca Electric Company was owned by the General Electric Company. The greater part of his time was taken up in making examinations of properties throughout the country in connection with the purchase of securities; he had examined a number of combination plants and had had full access to the figures showing results of operation.

Chairman Stevens asked Mr. Dame whether he had said that as good results could not be produced with belted machinery so far as the consumer was concerned as with direct-connected units. Mr. Dame said that as steady a light could not be given with the belted machinery from a high-speed engine as with the other. High speed, he explained, would be an engine that ran 175 r.p.m. to 200 r.p.m. or over.

Chairman Stevens told Mr. L. E. Carr that he had not connected the present company with the Brush-Swan company. Mr. Carr said that he could file a copy of each lighting contract which had been made to show how the business had followed during the 25 years.

Chairman Stevens also called attention to the fact that the Geneva-Seneca company was receiving $75 per arc lamp for lighting the streets and that the Economic company had offered at this hearing to fix the price at $65. Mr. J. O. Carr, of counsel for the Geneva-Seneca company stated that the lamp which the Economic company had offered at $65 consumed substantially only one-half as much current as the present lamp furnished by the Geneva-Seneca company at $75. The company was entirely willing to have the commission fix a rate which would be reasonable.

Chairman Stevens then announced that while the Economic company was operating without any authority at the present time, there would be no criticism on the part of the commission as to its continuance during the pendency of this case. Since it was proved by the applicant that it was actually engaged in business without authority of the commission and without the consent of the law, the commission should say either that it would not, at the present time, take any cognizance of that fact, inasmuch as the company was seeking permission of the commission, or that it would, and it therefore made the announcement that it would not take such cognizance.

Adjournment was taken with the understanding that further information might be requested by the commission or submitted on behalf of either company.

Proposed Baltimore Public Utilities Commission.

The controversy over the "electric clause" of the natural gas ordinance has led to a movement in Baltimore for securing a public utilities commission. The idea took some tangible form last week when former City Solicitor William Cabell Bruce endeavored to persuade the Charter Commission, of which he is a member, to recommend to the Legislature the extension of the powers of the Board of Estimates to include those of a public utilities commission. Mr. Bruce contended that the necessity for a public utilities commission exists right in Baltimore, where the operations of public service corporations in Maryland are largely confined, and for that reason he prefers a municipal rather than a State commission. In his opinion, the Board of Estimates could easily be clothed with the powers of a public utilities commission.

The suggestion has met with some opposition on the grounds, first, that the jurisdiction of a municipal utilities commission might be disputed where complaints are made against public service corporations whose lines extend beyond the city; and in view of the fact that the lines of the electric company, united railways, telephone companies and almost every other public service enterprise extend into the counties, such a commission might prove ineffective. The second objection is directed against constituting the Board of Estimates as a public utilities commission on the ground that the board, with the present heavy duties which it has to perform, could not give all of the attention required to supervising public service corporations.

Massachusetts Commission News.

The final hearing upon the relation of the proposed Boston & Eastern Electric Railroad to the existing and probable future transportation facilities in the Boston district was held by the Massachusetts Railroad Commission and the Boston Transit Commission, sitting as a joint board, on Oct. 26.

Mr. Frederick C. Dumaine, for the Boston Railroad Holding Company, stated that this organization now controls the Boston & Maine Railroad in accordance with recent legislation, and it is opposed to the building of the Boston & Eastern in its territory. The desire of the holding interests is to provide every point served by it with suitable facilities. Mr. Woodward Hudson, for the New York Central Lines, opposed the road on the ground of interference with developments planned in East Boston by the Boston & Albany division in connection with docks and terminals for transatlantic freight shipments. He also objected to the building of a tunnel under Boston Harbor by private interests.

For the Boston & Maine Railroad, Mr. William H. Coolidge pointed out the ability of that company to handle the business offered, and deprecated the entrance of any rival road into the present field. He stated that under the general railroad laws of the State, improvements can be ordered by the Railroad Commission if the board deems them necessary, and he contended that the advent of a new road would tend to prevent investment in established and future projects in the Commonwealth.

Mr. Bentley W. Warren, counsel for the Boston & Northern Street Railway Company, pointed out the improvements in suburban traffic conditions which would result from the electrification of the steam railroads around Boston, as indicated in the report of the Metropolitan Improvement Commission of 1909. He believed that the extension of the Boston Elevated system will improve conditions of travel in the nearer suburbs, and quoted the Improvement Commission to the effect that the present trackage facilities are adequate, with the possible exception of certain missing links which may be necessary after electrification in order to supply circuit movements. In his opinion, any new line should utilize the existing terminals of the Boston system and not attempt a separation of traffic. Mr. Warren also stated that if the road is to be built, it will injure existing facilities, but in any event should not be started until the money for the construction of the tunnel is placed in the hands of the Boston Transit Commission, which should investigate the desired route and design and build the tunnel under the harbor and the subway under the streets to Post Office Square, or whatever terminus is selected.

Mr. Frederic E. Snow, of the Boston Elevated Railway Company, reiterated the fitness of the company's present plans for terminal improvements to afford a satisfactory transfer point between the new road and the elevated system.

Mr. Moorfield Storey, counsel for the Boston & Eastern, closed the case by stating that his company offers a plan to serve the public in a new and profitable way, as favored by the Legislature of 1906 when it established the electric interurban railroad on a private right-of-way as a new and necessary addition to the transportation agencies of the State. The Railroad Commission has already declared that public convenience and necessity require the building of the road, and the issue now is: How can it be accomplished with the best results in connection with existing and future facilities? The present roads are, in his opinion, unequal to the task. The objections of the New York Central in East Boston can be overcome by suitable engineering skill. The Railroad Commission has already declared against terminating the road at Sullivan Square, on the Boston Elevated system. He urged that the Boston & Maine and the New Haven systems are both committed to such costly expenditures for betterment in the next few years that there is little chance of their carrying out the improvements needed in the line of electrification and high-speed suburban service. The road will bring traffic to other lines and will not injure the East Boston tunnel.

Following the Boston & Eastern hearing, the joint board

listened to arguments of Mr. Daniel J. Cronin for petitioners asking that the elevated structure in Washington Street, Boston, be removed between Oak and Dudley streets, and a subway substituted. Mr. F. E. Snow, for the Boston Elevated, contended that the elevated structure is owned by the company in perpetuity, and that the board has no authority to order its removal. Chairman Hall suggested that counsel submit briefs and the hearing was continued until Nov. 4.

New York Public Service Commission News.

The Public Service Commission of the First District of New York has notified the contractors who have been awarded the work of constructing the Fourth Avenue Subway in Brooklyn, to prepare to execute their contracts at once. The action of the Board of Estimate and Apportionment in voting the necessary $15,000,000 to build the line, from the Manhattan Bridge to Forty-third Street, which was taken last week opens the way for the actual work to begin as soon as the consents of the property owners can be obtained. The contractors have already deposited certified checks, but will, of course, be required to give heavy bonds before the work is commenced.

The commission has adopted a resolution modifying the Broadway-Lexington Avenue Subway plans so as to include a branch up to the White Plains Road from its juncture with Westchester Avenue to the West Farms Road. This addition will give the proposed route three branches and will add five miles to the line. It is estimated that the addition will cost about $4,000,000 and the total construction, including the Canal Street line, about $70,000,000.

The commission has been overruled by the Court of Appeals in the case of the South Shore Traction Company, the court holding that the company must be given its franchise. The South Shore Traction Company was given a franchise by the Board of Estimate and Apportionment permitting it to build a line across the Queensboro Bridge. The commission disapproved of some of the terms of the franchise and refused to give its approval. The Court of Appeals has now upheld the contention of the Board of Estimate that it possesses the sole power of fixing the terms upon which franchises may be granted for extensions to existing surface lines, and in providing for transportation across the bridges. The only point for the commission to decide is that there is a demand for the line by "public convenience and necessity."

The application of the Bronx Gas & Electric Company for permission to issue $1,500,000 of bonds has been granted. The company had asked to be allowed to issue $740,000 at once, but the amount of the immediate issue was scaled down to $624,636.

The Kings County Electric Light & Power Company has applied for authority to issue $5,000,000 of 6 per cent convertible debenture bonds, payable in 12 years. The proceeds of the bonds are to be used for extensions and improvements. The date for the hearing has not been fixed as yet.

Another hearing was held last week on the 10-cent-Coney-Island fare question, but no conclusion was reached. The Coney Island & Brooklyn Railroad contends that a reduction of the fare would be an injustice to the security holders, who would thereby be deprived of any chance to get returns on their investments.

The commission has adopted an order requiring the New York & Queens County Railway Company to double track its line between Flushing and College Point and also in Flushing. Between Flushing and Jamaica the company is required to lengthen the turnouts and switches and to maintain a headway of five minutes during the rush hours.

The Public Service Commission, Second District, has granted authority to the area and territory known as Sylvan Beach, in the town of Vienna, Oneida County, to build, maintain and operate for other than municipal purposes, an electric plant and distributing system for the generating and supplying of electricity.

The commission has received an application from the Elizabethtown Terminal Railroad Company for a certificate of convenience and necessity. The proposed railroad will extend from Westport, where it connects with the Delaware & Hudson to Elizabethtown, a distance of eight miles, and will be of service to the towns of Lewis, four miles north of Elizabethtown and Keene, 12 miles west, all in the county of Essex. Freight and other business from these points are now hauled from Keene via Elizabethtown. The only way of reaching Elizabethtown is by way of the Elizabethtown-Westport Turnpike Company, which operates a toll road. The motive power to be used for the operation of the rolling stock of the proposed road will consist of combination passenger motor cars operated by gasoline. The common capital stock will be $80,000. The directors of the corporation are Richard L. Hand, Francis A. Smith, George W. Jenkins, Livingston Woodruff, Merritt O. Stanton, Victor W. Prime, Robert B. Dudley, Benjamin F. Stetson, Elton A. Foote, and Harry H. Nichols, all of Elizabethtown. The commission will hear the application at Albany on Tuesday, Nov. 16.

The commission has authorized the Hilton Electric Light, Power & Heat Company to issue its capital stock to the amount of $5,000, and has authorized this company to construct a plant and exercise franchises in the village of Hilton, Monroe County, also to issue $5,000 capital stock for the expense of the construction of its plant.

Charles Austin Borst, of the village of Clinton, Oneida County, has been authorized to exercise rights and privileges under a franchise granted him by the Superintendent of Highways of the town of Kirkland, Oneida County, and to construct and maintain poles, wires and electrical apparatus on Utica street, in the village of Clinton, for the purpose of conducting electrical current from his power house to the corporation limits of the village of Clinton, to be sold and used by the village for municipal and other purposes. The Vestal Lighting Company has been authorized to issue its capital stock in the amount of $1,000, the proceeds to be used for the construction and equipment of pole lines in the town of Vestal, Broome County. The A. L. Swett Electric Light & Power Company has been authorized to execute and deliver certain coupon sheets and to assume mortgage indebtedness amounting to $74,500 on the property of the Albion Power Company. The petitioner on Sept. 10 acquired from foreclosure sale certain property, contracts, rights and effects formerly owned by the Albion Power Company.

Wisconsin Rate Commission News.

On Oct. 26 the Wisconsin Rate Commission granted the petition of the Bloomer Telephone Company for a readjustment of its rates. Practically all residences heretofore have been on single lines and the petitioners testified that the increasing number of subscribers is overloading the residence leads besides taxing the capacity of the present switchboard. As any further increase would necessitate the use of cable, and wishing to obviate the immediate large expenditure for cable construction, the company desired to put the residence subscribers on the two-party basis and to charge them the same rates as they had previously enjoyed on the single-line basis. The single-party rate was increased to $1 and the two-party rate left at 75 cents per month.

The Grand Rapids Street Railway Company was authorized to issue 1250 shares of common stock at a par value of $100 per share, the funds derived from the sale of stock to be used in the construction and equipment of a line of street and interurban railway running from Grand Rapids to Nekoosa, Wis.

Authority has been granted the Antigo Electric Company to issue 500 shares of common stock of the par value of $100 for the purpose of supplying the said company with funds for making additions and improvements to the electric plant in the city of Antigo and to pay the outstanding indebtedness of the said plant.

A peculiar condition has arisen in the petition of the Fond du Lac Business Men's Association vs. the Wisconsin Telephone Company. The directory published by the company contains the advertisements of outside firms and this has been made the subject of an appeal to the commission by the business men of the city. The commission has not as yet taken any action on the case.

CURRENT NEWS AND NOTES.

RADIUM $2,500,000 AN OUNCE.—In a recent address Sir William Ramsey said that while it once was possible to buy radium at $2 a milligram, the market price is now $90 a milligram, equivalent to $2,500,000 per ounce.

LECTURES AT COOPER UNION.—Among the courses of lectures to be offered at Cooper Union, New York, is one on "The Relation of Magnetism to Electric Currents," by Prof. John S. McKay, of Parker College Institute, which will be delivered on Saturday evenings throughout the session.

N. E. L. A. COMMITTEE ON ELECTRICAL NOMENCLATURE.—The National Electric Light Association has appointed the following as members of its recently authorized Committee on Terminology. Mr. W. H. Gardiner, chairman; Dr. C. P. Steinmetz and Messrs. Ralph D. Mershon, R. S. Hale and A. S. Loizeaux.

LONG-DISTANCE WIRELESS.—It is stated that the Great Northern steamship *Minnesota,* on her recent voyage from Seattle to Japan, a distance of 4500 miles, was in constant communication with both of the shore stations throughout the whole trip. The Pacific Mail liner *Korea* is reported to have transmitted a message 3300 miles to San Francisco on Oct. 29. The ship at that time was 2680 miles from Japan.

GAS-PRODUCER TESTS.—A recent bulletin of the U. S. Geological Survey has for its subject "Incidental Problems in Gas-Producer Tests," the authors being Messrs. R. H. Fernald, C. D. Smith, J. K. Clement and R. A. Grine. A greater part of the bulletin is taken up with a discussion as to the proper length of gas-producer tests. Information is also given as to details of such tests.

N. E. L. A. MEMBERSHIP CAMPAIGN.—An active campaign for increasing the membership of the National Electric Light Association is being instituted by Mr. H. H. Scott, chairman of the membership committee. This will not be confined merely to direct solicitation of membership, but present members will be asked to give direct aid in working up "prospects" in their territory.

PENNSYLVANIA TUNNELS.—The tunnels built by the Pennsylvania Railroad Company for the operation of its trains electrically under New York City will be described at two meetings of the American Society of Civil Engineers. On Dec. 1 Messrs. J. H. Brace and Francis Mason will present a paper dealing with the cross-town tunnels, while on Dec. 15 the same authors will present a paper devoted to the East River tunnels.

UNITED STATES WATER-POWERS.—The United States Geological Survey has just issued a pamphlet (paper 234) which deals with the conservation of water resources and the water-powers of the country. It is stated that out of 37,000,000 hp available in water-power at the minimum flow of streams, but little more than 5,000,000 hp has been developed, or about one-seventh of the minimum available power. The State of New York has the largest development with 885,862 hp, California standing next with 466,774 hp. The publication presents statistical tables of water-powers covering all sections and States.

STEAM TURBINE-ELECTRIC LOCOMOTIVE.—President Hugh Reid, of the Glasgow University Engineering Society, has announced as under construction a new locomotive, which appears to be based electrically on the Ward Leonard system, but employing a steam turbine to generate electric power for application to the driving motors. The new locomotive, which is now being built by the North British Locomotive Company, will have a boiler of the ordinary locomotive type, which will supply steam to a turbine running at a speed of 3,000 r.p.m., and direct-connected to a direct-current, variable-voltage generator, which will supply electrical energy to four series of motors having armatures built on the four main driving axles of the locomotive.

TRAFFIC INTERCHANGE BETWEEN STEAM AND ELECTRIC ROADS.—The Interstate Commission will soon take up the matter of a complaint of the Columbus Traction Company, of Columbus, Ohio, against the Baltimore & Ohio South Western, Norfolk & Western and other steam roads for refusing to permit physical connection to be made between the tracks of the electric line and the steam roads, and also for refusing to make through routes and joint rates for either freight or passengers. While the law does not explicitly require connection between the two systems of railroads, it is stated to have been the policy of the commission to require such connections where the conditions appeared to demand or even to warrant them, and that through routes and joint rates for freight and passengers naturally follow.

RAILWAY SIGNALING DISCUSSED.—At a special meeting of the Armour Institute of Technology branch of the American Institute of Electrical Engineers, held in the engineering rooms of the Armour Institute, Chicago, on Oct. 28, Mr. C. C. Bailey presented a paper on "Railway Block Signaling." Mr. Bailey, who is a senior in college, described the development of electric signaling on railroads, beginning with the telegraph block system. The controlled manual system was explained, with the use of diagrams, and statistics were given showing the economy resulting from the adoption of this method of train operation. The disk and semaphore systems were compared and different types of semaphore mechanisms were explained. The alternating-current single-rail plan of signaling was then taken up, and this was followed by a short résumé of the principles involved in electro-pneumatic signals. The meeting closed with a discussion of the features of operation of the various systems of signaling in use on both steam and electric railways.

UNITED STATES WATER-POWER CONCESSIONS.—In a recent letter, which takes the form of a public statement, Forester Gifford Pinchot points out that the renewal of a water-power permit at the end of 50 years is at the option of the Government, is revokable by the Secretary of the Interior, but unless revoked continues 50 years, when it terminates without any special action, and may then be renewed at the option of and under conditions fixed by the Government. He says that the increased radius of practicable electrical transmission, and the recent financial history of the country as to consolidations of other kinds of business, seem to justify the belief that there is a strong tendency toward concentrating control of hydroelectric development of the United States. The nation, he says, should understand these tendencies, realize their import and take effective steps now while there is yet time to retain and exercise public control of national water powers. This he says may be done by giving concessions limited in time, requiring a fair rental and imposing conditions to prevent evils which experience has taught are to be expected from unregulated monopoly.

NEW ENGLAND Y. M. C. A. ELECTRICAL COURSES.—The Taunton (Mass.) Y. M. C. A. has commenced an electrical course which will extend over the fall and winter. It will be in charge of Messrs. James Craig and W. B. Clayton, of the Lynn works of the General Electric Company. Similar courses will be given at Lynn, Salem and Gloucester to Y. M. C. A. classes.

ILLUMINATED GARDEN.—Mr. James O. Dobson, of Portland, Me., has provided for illumination of the ornamental garden in front of his residence, using for this purpose 230 2-cp lamps. The lamps are placed in an effective way among shrubs, trees and plants, allowing the light to shine through the leaves. A Lombard poplar has 85 lights extending to the top, giving it the appearance of a Christmas tree. The various lamps are in groups controlled by four switches.

"EDISON LIFE."—The monthly publication of the Edison Employees' Club and the Boston Edison Company has adopted for its name *Edison Life*. As previously noted, the first issue was entitled *Edison Extra*, and a prize offered for the best suggestion of a permanent name, which has been awarded to Mr. Harry B. Knight. Sixty-three persons offered a total of 173 names, and that suggested by Mr. Knight received the unanimous approval of the committee which awarded the prize.

AUTOMATIC BLOCK SIGNALS ON ROCK ISLAND RAILROAD.—On June 30, 1909, 346 miles of main line on the Chicago, Rock Island & Pacific Railroad were protected by automatic block signals which have cost $456,359. The work of installing automatic block signals between Davenport and Muscatine, Ia.; between Davenport and Iowa City, Ia., and between Topeka and Herington, Kan., was completed during the fiscal year ended June 30 last. Signals for 232 miles of main line in the State of Iowa are being installed.

ELECTRICAL WORK ON THE ISTHMUS.—The first of the three turbo-generators in the Miraflores power station on the Canal Zone, Isthmus of Panama, has been completed. Wires have been strung on the transmission line leading from this station to the Pedro Miguel locks, and work will soon be begun on the new substation at that point, which is to be equipped with two 500-kw rotary converters. It is interesting to note that a little over one-half of the total excavation to be made for the Panama Canal has now been completed.

LARGE AUSTRIAN HYDROELECTRIC PLANT.—A company called the Società Adriatica d'Elettricitcità has been formed in Fiume, Austria, for the purpose of erecting a central generating station equipped with an installation capable of developing 45,000 hp to 50,000 hp, which may, if necessary, be increased to 80,000 hp. The capital of the company will be about $5,000,000. The motive force will be obtained from waterfalls of the River Gaska, near Otociac on the Croatian frontier. The energy generated will be utilized for lighting and industrial purposes.

MULTIPLEX WIRELESS TELEGRAPHY.—An invention has been patented in Berlin by F. van der Wonde which adapts wireless telegraphy to multiplex working. The antenna is joined to a spiral device carrying a number of contact arms, which, when revolved, makes the following connections: (1) Transmitter joined up; (2) antenna earthed; (3) transmitter cut out; (4) receiver joined up; (5) earth disconnected; (6) receiver cut out. The speed of action is such that several revolutions take place during the time necessary for the sending of a Morse dot.

AN AVERAGE OF 299 ELECTRIC SUPPLY CONTRACTS A DAY.—The business of extending the central-station electric service in Chicago is being prosecuted at present in various directions with remarkable success. It is reported that during the month of September the contract department of the Commonwealth Edison Company closed an average of 299 contracts for new business for every working day in the month. Since then the campaign has been and is being carried on with equal vigor. Clerks are employed at night to keep pace with the business taken in during the day.

LOYOLA UNIVERSITY.—As an outgrowth of St. Ignatius College, which has been conducted by the Jesuits in Chicago for a number of years, an institution of higher learning and wider scope has been developed and it bears the name of Loyola University. The name St. Ignatius will be retained for the school of arts and sciences, but it is the intention to have a university complete in all departments. With this view, 17 acres of land have been purchased at Devon Avenue and Sheridan Road, Chicago. One feature will be an engineering school which will be opened next September, according to present plans. This school will emphasize training in broad scientific fundamentals, with the thoroughness for which the Jesuits are noted. The Rev. Alexander J. Burrowes, S. J., is the head of the new university.

PENNSYLVANIA RAILROAD NOT QUITE CONSISTENT.—While strenuously denying the feasibility of electrifying its terminal in Chicago, the Pennsylvania Railroad "points with pride" to the advantages of electrical operation in its New York tunnel extension. The publicity department of the railroad sent to the Chicago daily newspapers on Oct. 29 a long account of the new "Pennsylvania type" electric locomotives to be used in New York. These locomotives are to be used in tunnels, and in that respect the New York situation differs from that in Chicago. Nevertheless, the simple Chicago people think it strange that electrical operation for New York should be set forth with such acclaim while the mention of similar train service in Chicago should be received with emphatic disapproval on the part of the railroad company.

SPECIAL STREET ILLUMINATION IN CHICAGO.—Continued interest is manifested in Chicago in the formation of a business men's lighting association to establish special street illumination in various localities to attract business. Several of these projects were described and illustrated in an article published in our first issue of September. Since that time merchants of other localities have entered into a contract to supply special illumination of this nature. One is on West Twenty-sixth Street, near Kedzie Avenue, where there are 55 lighting units, each consisting of four 60-watt tungsten lamps supported on an attractive post. The second locality to avail itself of this up-to-date form of street advertising is Milwaukee Avenue, near Armitage Avenue. For some time there has been a special illumination of this character on Milwaukee Avenue near Chicago Avenue, but the newer equipment is distinct from this. The Commonwealth Edison Company supplies electricity for all of these street-lighting equipments.

FIRE AND POLICE ALARMS IN LOS ANGELES.—As the result of advertisements for bids for supplying the University District of Los Angeles with fire-alarm and police-alarm signaling systems, four systems were recently demonstrated in that city. These were the signalphone, made in Milwaukee; a system developed by Siemens & Halske, of Berlin; the well-known Gamewell equipment (fire-alarm boxes only), and the system of A. L. Gregier, of Chicago. A committee, consisting of Mr. Manahan, city electrician; Mr. Frankhauser, city telephone and telegraph superintendent, and Mr. Alfred L. Sohn, will report on the competing apparatus. It is desired, if practicable, to connect the new installation with the Gamewell system which is used in other portions of the city. The German system, demonstrated by Dr. Karl Georg Frank, the American representative of the company, attracted attention by its thoroughness and excellent workmanship. The American systems revealed the ingenuity which has been so highly developed in this country in these classes of electrical signaling.

Electrical Equipment of the Luzerne County Court House.

THE Luzerne County Court House at Wilkes-Barre, Pa., is a monumental structure, cruciform in shape, the length of each axis being 200 ft. Erected in one of the richest counties of the State, the building vies with other architectural structures of note in the country and possesses a benefiting position on the banks of the Susquehanna River. The center of the structure is given up to a rotunda 53 ft. x 53 ft. capped with a dome whose base is 100 ft. above the floor. The various court rooms and offices are reached from the corridors and galleries encircling the rotunda. Marble is used throughout in the finish of the latter, as well as in the arches of the penetrations under the dome. Supporting the dome are four piers of buff-colored marble. The rusticated walls around the first floor are of Botticino stone; while the cornices, columns, balustrades and corridor wainscoting base are finished in Alps green. In the marble cornice of the second story and in the marble balustrades of the second-story gallery and main stairway, statuary-finish bronze has been used to advantage. The elevator enclosures, electroliers and office screens are of cast bronze, and Tennessee marble is used for the floors.

The interior of the dome is executed in plaster and colored the prevailing tints of the stone, embellished with portraits and emblems painted as cameos. The pendatives are painted with figures on mosaic backgrounds. Mosaics are also employed in the vaulted ceilings of the rotunda corridor and entrance corridors, the pendentives holding portraits of persons of prominence connected with the early history of Luzerne County. The lunettes along the corridor walls have paintings depicting the early settlement of Wyoming Valley, the heart of the anthracite coal district of Pennsylvania, in which Wilkes-Barre is located.

There are five court rooms in the building, four on the third floor and one on the second floor. The court rooms on the upper floor are similar in design, the finish in two being mahogany and in the other two Circassian walnut. The chambers of the judges adjoin the court rooms and are similarly finished. The treatment throughout is rich and somber and the electroliers used are of brass, gold plated. The court room on the second floor has a wainscot of paneled white marble and the law library, stack room and bar association room in the south wing of this floor are finished in dark oak; the base and fireplace face in the law library being Numidian marble.

There are 3600 incandescent lamps used in the illumination of the building, consisting of 16-cp, carbon-filament lamps and 25-watt tungsten lamps, the tendency being to replace all of the former by the latter. In addition there are 437 hp in motors, so that the electrical installation is the largest of its kind in northeastern Pennsylvania. Although the county commissioners had instructed Messrs. McCormick & French, the architects, to design a complete power plant for the building, the latter found, after an extended examination of the different plants throughout the State, cost of running a plant of the proportions required, etc., that the cost of operating such a plant would be greatly in excess of the rate offered by the Wilkes-Barre Gas & Electric Company, and that the proposition offered would save the county considerable expense in the consumption of energy, maintenance of plant, interest, depreciation, etc. The matter was placed before the commissioners and they decided to install the necessary motors, transformers,

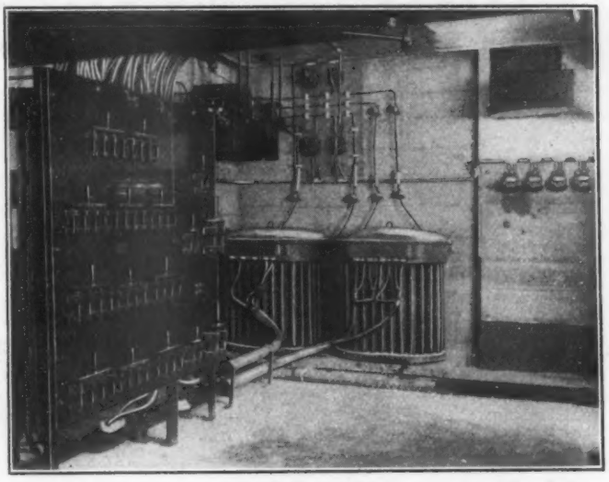


FIG. 2.—SERVICE TRANSFORMERS AND SWITCHBOARD.

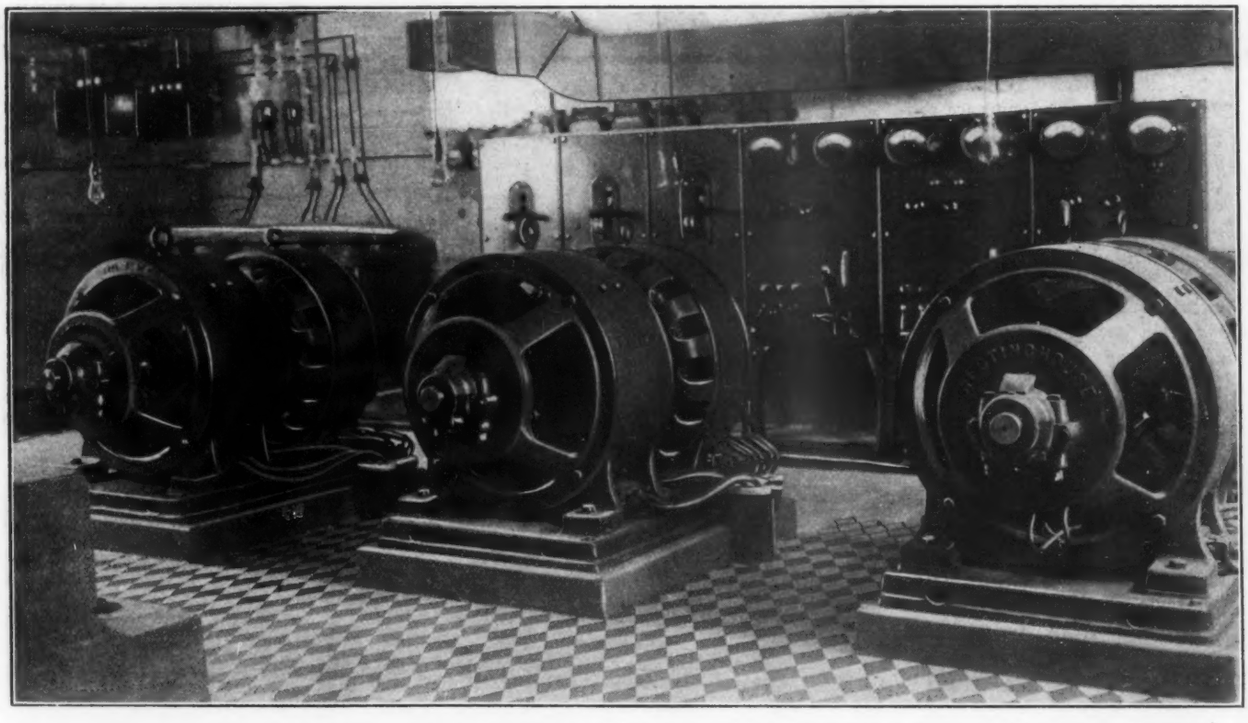


FIG. 1.—MOTOR-GENERATOR SETS IN LUZERNE COUNTY COURT HOUSE.

etc., and secure the electricity from the local electric light company at a rate of 3 cents per kw-hour, the meters being on the primary side of the transformers.

The feeders from the Wilkes-Barre Gas & Electric Company's circuits enter the building underground on what is known as the transformer room. Lead-covered cable in iron conduit is used for this service connection.

FIG. 3.—ONE OF THE FOUR COURT ROOMS ON THIRD FLOOR.

The service tension is 2200 volts, and this is stepped down for lamp circuits in two 75-kw transformers. The primary wires are No. 4 duplex, lead-covered, and are provided with suitable pot-heads at all terminals. The secondary cables are of rubber-covered stranded copper with a cross-section of 1,500,000 circ. mils, run in iron conduit. At the point where the service wires enter, oil circuit-breakers are installed on the wall, each having a current-carrying capacity of 200 amp at 2200 volts. The circuit-breakers are arranged to release automatically on overload. From the circuit-breakers the lines run to the transformers and thence to the main distributing board. The transformers shown in Fig. 2 have since been housed in a fireproof vault built around them. From the same circuit-breakers in the transformer room, the primary mains are extended to a starting panel board controlling three 50-kw motor-generator sets. On each starting panel are three, double-throw, oil-immersed circuit-breakers provided with adjustable tripping devices which are independent of the operating handle and are arranged to release automatically. On the rear of the board are mounted the starters for the motors, which are rated at 75 hp and are two-phase, 2200-volt, 60-cycle machines running at 840 r.p.m. Each generator has an independent switchboard panel equipped with circuit-breaker, switch, ammeter, voltmeter, field rheostat and ground detector plug. All conduit, sheath of cables, frames of motor-generator sets, etc., are grounded.

The steam for heating the building is obtained from the jail not far from the court house. There are six motor-driven fans used in the heating and ventilating system. Each of the motors is a 220-volt, direct-current machine fitted with interpoles so as to obtain wide speed variations without sparking. Four of the motor-driven fans are used in connection with the hot-air system and two are used for exhausting the air from the rooms. A spraying device is used in connection with the heating system to impart the necessary humidity to the atmosphere, and the four pumps used are driven by 3-hp motors. All the motors throughout the building are automatically controlled, and owing to the necessity of running the motors at different speeds, direct current was specified as giving the best control. Interpole motors are also used to drive the pumps employed in connection with the hydraulic elevators, with which the building is equipped. Two 30-hp motors are used for this purpose, and a 5-hp motor drives an air compressor used to supply air to the hydraulic tanks. Two small air pumps are also used in connection with thermostats in the various rooms to furnish compressed air for opening and closing the hot and cold-air dampers in the heating system. Each of these motors is rated at ½ hp.

FIG. 4.—ORPHANS' COURT ROOM, LUZERNE COUNTY COURT HOUSE.

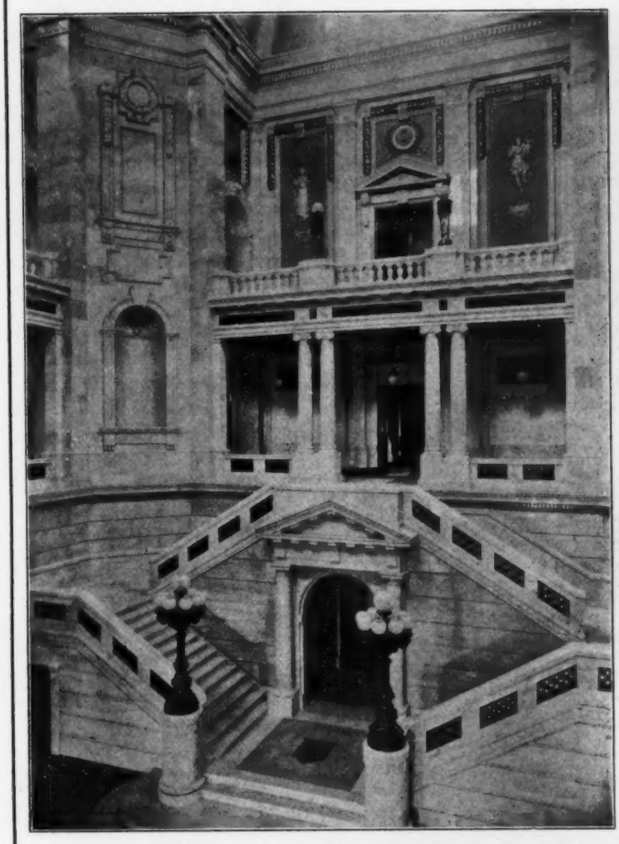


FIG. 5.—ROTUNDA OF LUZERNE COUNTY COURT HOUSE.

FIG. 7.—SECOND-FLOOR GALLERY.

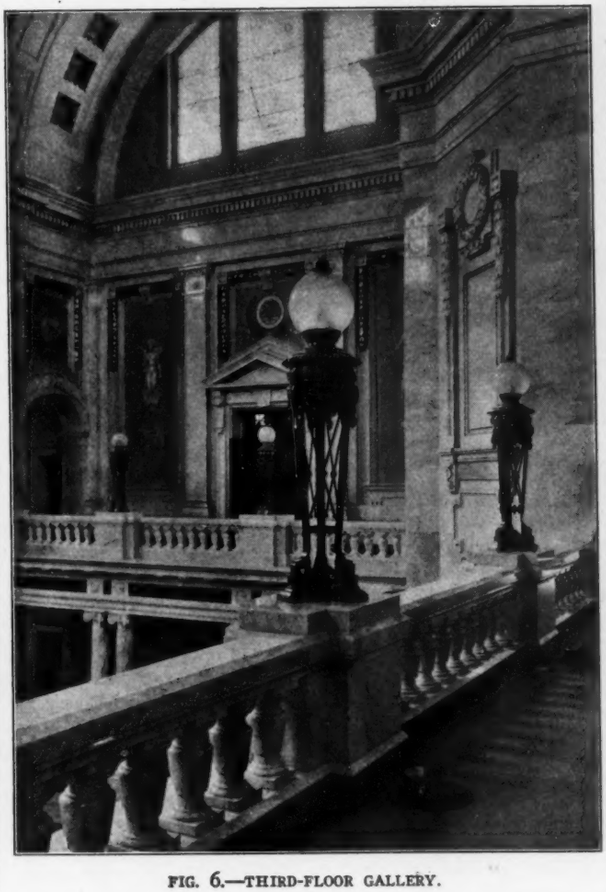


FIG. 6.—THIRD-FLOOR GALLERY.

FIG. 8.—FIRST-FLOOR CORRIDOR AROUND ROTUNDA.

ELECTRICAL EQUIPMENT OF THE LUZERNE COUNTY COURT HOUSE.

The illumination of the building is particularly pleasing. A feature which appealed to the general public which viewed the structure when it was thrown open to the public for the first time since its acceptance on Oct. 28, was the lighting of the dome. This satisfactory piece of illumination is obtained by means of 640 lamps placed in aluminum parabolic reflectors on top of the marble cornice around the rotunda and by 320 lamps similarly equipped in the base of the dome. The reflectors are arranged so that the light from each lamp strikes the opposite side of the dome and the art-glass cap of the dome is illuminated by fixtures above it. Viewed at night the effect is very pleasing; not a lamp is in sight nor a reflection on the white marble to indicate the presence of lamps. Every painting and piece of decoration stands out in bold relief, and the absence of shadows and the general uniformity of illumination have been the subject of much favorable comment. The wiring throughout the building is in rigid conduit, with short stretches of flexible conduit here and there to meet certain conditions.

FIG. 9.—LAW LIBRARY, LUZERNE COUNTY COURT HOUSE.

Magnificent bronze chandeliers and fixtures have been installed in the court-rooms, offices and corridors which add materially to the artistic surroundings. At the two entrances there are four bronze bracket lanterns in each of which there are 10 25-watt tungsten lamps. Hanging within the porch are three lanterns, each holding six incandescent lamps, and in the lobby to the main entrance are eight ceiling outlets feeding 48 lamps.

In the corridors around the rotunda are three lanterns hung from the vaulted ceiling on each of the four sides with a five-lamp fixture at each corner, the latter differing in design from the former, which are merely suspended spheres, as shown in Fig. 8. On either side of the grand stairway, resting on the newels, are two standards, each holding 15 25-watt tungsten lamps in outer opalescent globes and the eight standards arranged around the balustrade of the third floor have three lamps in each globe. The corridors on the second floor are lighted on the same general scheme as those on the first floor.

Passing from the corridors, the lighting of the individual rooms calls for some mention. The four courtrooms are used very rarely at night or when much artificial light would be necessary. The general tone of the furnishings and decorations being dark, much light is, of course, absorbed. Sufficient general illumination is obtained, however, from two magnificent chandeliers. Each of these has eight arms arranged to support three lamps within an outer globe. In addition there are a number of portable lamps for the tables fed from Krantz floor boxes and fitted with amber-colored glass shades. The Orphans' Court, on the second floor, is fitted with 12 ceiling fixtures of the type shown in Fig. 4, each of which holds three lamps. Numerous portable desk standards are also employed.

A very warm and cozy effect is obtained in the illumination of the law library. The general color scheme is subdued, and this is enhanced at night by the light from a center orange-amber colored fixture in which 15 lamps are placed. On the walls near the ceiling are also 10 bracket lamps each holding three lamps enclosed in ivory-tinted shade. On the desk are six portable lamps fitted with amber-glass shades. The book cases are lighted by means of 25-watt lamps placed in half-round aluminum reflectors and burn in a horizontal position. The filing cases, stackrooms, etc., are similarly lighted with lamps attached to the cases. Adjoining the law library is the room of the bar association. This is lighted by two six-lamp chandeliers and portable desk standards.

The architects of the building under whose supervision the installation was made are Messrs. McCormick & French, of Wilkes-Barre. Mr. E. F. Roth, of the same city, was the electrical contractor, and the motors and other electrical equipment were built by the Westinghouse Electric & Manufacturing Company. All the wire used was of local manufacture, being made in the mills of the Hazard Manufacturing Company. The Enos Company, of New York, supplied the electrical fixtures.

Village Electric Light Plant.

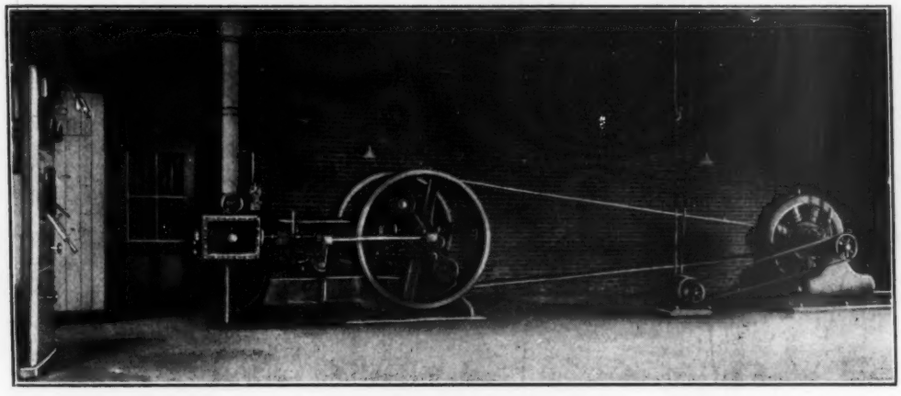
Nestling among the hills of Yates County, in Western New York, is the village of Dundee. It is situated in the heart of the lake region of New York and has a population of 1300 people. The country surrounding it is devoted to the culture of small fruits and grapes. There are several thousand acres of apple orchards and small fruits, and the hillsides are covered with vineyards. All the residence streets are bordered with magnificent elm and maple trees, forming an archway over the road. Every street and avenue in the village has its concrete sidewalks complete, and the prominent thoroughfares are parked.

Serving this delightful community is the Dundee Electric Lighting Plant, managed and owned by Mr. Edward L. Bailey. The station is adjacent to the railroad depot of the Pennsylvania division of the New York Central Railroad, and contains a 60-kw General Electric single-phase, 60-cycle, 1100-volt alternator belted to an Imperial high-speed, automatic engine, and another unit of similar characteristics rated at 90 kw. The boiler-room contains two 100-hp return-tubular boilers, burning soft coal costing $2.15 per ton. Water is taken from the railroad tanks near by under a head of 35 ft., in return for which the depot and freight house are lighted free of charge. A day-and-night service is maintained, and in anticipation of increased load the management is planning to

install a 150-hp boiler and a 20-kw unit to carry the load after midnight.

The circuits are all overhead, needless to say, but the poles for the most part are placed within the front yards along the streets, so that not one-third of the poles are on the public thoroughfares. In this way the tax on poles on public highways levied by the State is kept at a minimum. Sawed octagonal poles are employed, and these are painted a dark olive green so as to make them inconspicuous. Being within 3 ft. of the fence lines, troubles from shade trees, with which the village abounds, are minimized. The day load at present consists of 37 hp in motors; three rated at 10 hp, one at 5 hp and one at 2 hp. Two more 10-hp motors will be installed shortly and also a number of small motors. The management expects to do all the pumping for the railroad, and also to supply energy to a four-mile single-phase railway to be built next spring. The railway will connect Dundee with Starkey Station on the Northern Central Railroad of the Pennsylvania System, and will continue on to Seneca Lake, making connection there with steamers plying between Geneva, Watkins Glen, etc. Lakemont and Himrod will also be supplied with electricity next year from the Dundee station.

The accompanying illustration gives a view of the first unit installed in the station in January, 1898. This unit has been run constantly without shut down or interruption for nearly 12 years, and for the past six months on a 24-hour service. The brushes on the machine were renewed but once and the entire outfit appears as good now as when installed. The exciter is now on the base of the frame.



ELECTRIC LIGHT PLANT, DUNDEE, N. Y.

Steam heat is supplied from the station to a brass foundry directly across the road from the station. The night load on the station is about 500 amp on 1100 volts. A contract has been made with the village to light the streets with 63 100-watt tungsten lamps in place of the 25-cp carbon-filament lamps at present in use for $1,800 per annum. The company at present receives $1,500 per annum for this service.

All customers have been gradually changed over from a flat rate to a meter basis, and the rate for energy varies with the load. The maximum rate is 20 cents per kw-hour on a consumption of $3 and less per month. Persons using $18 worth of electricity are given a rate of 15 cents per kw-hour and the minimum rate is 10 cents on a yearly consumption of $36 and over. No discount is allowed for cash, and interest at the rate of 6 per cent is added on all bills not paid on the tenth of the month. All bills are payable at the Dundee National Bank. On the first of each month a list of the customers, together with the amount each owes, is sent to the bank, and, although kept behind the desk away from public scrutiny, its effect is such that no bills remain unpaid, consumers feeling that their credit in the village will be impaired if their electric light bills remain unsettled.

The company has 150 customers and the system is run by four men. The station is operated by three men in three shifts. Each man does his own firing, carting of coal from a spur track, cleaning, etc. The chief engineer does wiring with a helper, and looks after the customers' wants and the general condition of the circuits. He devotes his afternoons to this work. A line of supplies is carried at the station and also in the office on the main street. The circuits have been singularly free from mishaps; the primary is protected by arresters at various points and when the transformers are oiled in the spring, an inspection is made of the lines, etc., at the same time. The secondary circuits are not grounded, and the house-wiring work is chiefly concealed knob and tube, installed according to the Code requirements. The gross income of the plant is approximately $8,500.

Electrical and Mechanical Equipment of the Blackstone Hotel, Chicago.

Now that the exterior of the Blackstone Hotel at Michigan Avenue and Hubbard Place, Chicago, is practically finished, all beholders agree that it is a beautiful architectural addition to the city. The building is 20 stories high, and the top of the mansard roof is 287 ft. above the sidewalk. A picture of it was given in the *Electrical World*, May 20, when a brief outline of the proposed uses of electricity was given. The interior finishing and furnishing of the hotel will be in keeping with the beautiful exterior, and at the present time a more detailed account can be given of the electrical and mechanical features than was possible at the earlier date.

There will be a power plant in the basement on a level 28 ft. below the street. The general arrangement is shown by the accompanying drawing. The plant will contain four 250-hp Stirling water-tube boilers with McKenzie chain grates. Coal will be brought in through a sub-basement connection with the freight-tunnel system of the Illinois Tunnel Company, and a complete system of coal and ash conveyors of the Stephens-Adamson type will be installed. Ashes may be removed either through the tunnel or brought to the surface of the street. A traveling weight-hopper, driven by an electric motor, will deliver coal from the bunkers to the furnace magazines. The chimney extends 328 ft. above the grate bars. It is of steel with an elliptical section 6 ft. x 7 ft. in diameter. The breaching and stack are lined with Johns-Manville vitrobestos. One Wainwright feed-water heater will be installed, and all pumps will be of the American Steam Pump Company's single-cylinder type. All steam mains of 3 in. and above will have welded flanges and Nelson valves.

In the engine-room there will be three generating units, consisting of four-valve engines made by the Ball Engine Company, of Erie, Pa., direct-connected to Western Electric direct-current generators. One of these units will be rated at 300 kw and two at 200 kw. The generators are wound for 250 volts and connected on the three-wire system. A switchboard of pink Tennessee marble has 14 panels, three for the generators, one totalizing panel for the station, six for lighting circuits and four for motor circuits. The busbars are so arranged that the lamp and motor circuits can be operated separately or together, the lighting at 125 volts and the motors at 250 volts, and any machine can be connected either to the lighting circuits or to the motor circuits.

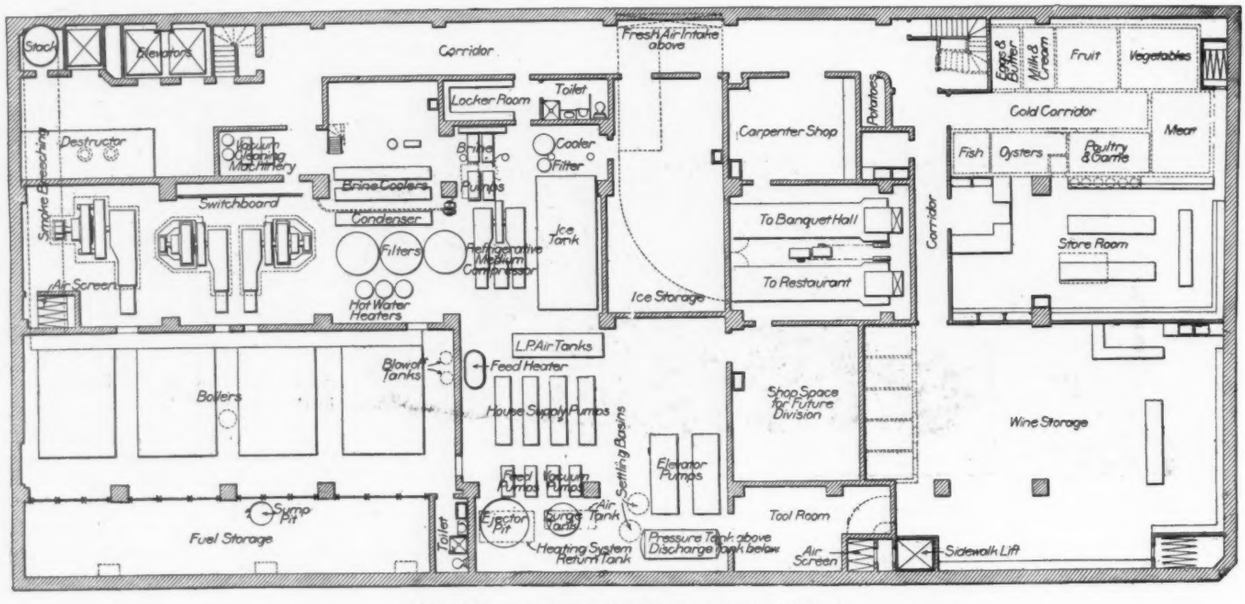
A feature of the engine-room is the refrigerating machinery. This consists of two carbonic-acid compressors driven by Murray rolling-mill engines. One of these machines, of 50 tons capacity, is used for ice making and refrigerating purposes for the house. The other, of 120 tons, provides the air-cooling for cafés, restaurants and banquet halls in summer.

Four house-service pumps are installed. The building is so high that it was thought wise to divide the water-supply system into two sections. The upper floors have a high-pressure system and the lower floors a low-pressure system. The upper floors are fed by gravity from large enamel-lined tanks on the roof, and the lower floors are supplied by direct upward pressure. All water used in the hotel is filtered. The high-pressure system is available throughout the whole building in case of fire.

Heating is accomplished by the exhaust steam from the engines. The vacuum system is used and by its means all water of condensation is returned to the power plant. The Illinois Engineering Company installed the vacuum system of heating. Heating is accomplished by both direct and indirect methods. By the latter system the air is heated in the power plant and is forced through large ducts to the compartments heated, which consist of all cafés, restaurants and public reception rooms. An elaborate ventilating system has been installed in the hotel.

The kitchen and all service pantries have a separate ventilating system with a separate stack extending to the roof. The hotel service. The rise of these elevators is 250 ft. and four of them are of the Otis traction gearless type and two of the traction worm-gear type. The elevator mechanism is placed overhead, a 50-hp motor, turning at 60 r.p.m., being provided for each outfit. A telephone is placed in each elevator car, and there are electric lamp signals. Three hydraulic elevators are also installed, one running to the ballroom, which extends through the second and third floors; one for service to the kitchen on the second floor and the third a sidewalk elevator for supplies. The hydraulic pumps for these elevators are placed in the basement.

Two Burdett-Rowntree dumb-waiters extend from the first floor to the eighteenth. Each is operated by a 7½-hp motor placed above its shaft. The operation of these dumb-waiters is under the control of a dispatcher in the kitchen and is automatic and ingeniously worked out. If an attendant in one of the service pantries wants an elevator he pushes a button which lights a lamp at the dispatcher's station in the kitchen. Lamp signals also indicate the position of each elevator to the dispatcher, who operates the cars by push-button control. On receiving the signal from the service pantry, the dispatcher



BASEMENT PLAN OF BLACKSTONE HOTEL, CHICAGO.

restaurants, cafés and all public service rooms are amply provided with a forced circulation of fresh air heated in winter or cooled in summer. The foul air is exhausted from the rooms through a separate system. All exhaust fans for the ventilating system are located on the upper stories and driven by electric motors. The forced-draft fans for the indirect heating and for ventilation are placed in the basement. The air is cooled in summer by the direct expansion of carbonic acid in coils in the fan chambers.

In designing the power plant an effort has been made to secure a certain degree of uniformity and to provide for interchange of electric motors in case of necessity. The contract for furnishing the motors has been awarded to the Allis-Chalmers Company. The Ward Leonard Electric Company, of Bronxville, N. Y., will supply the controlling apparatus for the motors and the J. Lang Electric Company, of Chicago, will furnish the switchboard. An interesting feature of the power plant is a completely equipped machine shop in the basement, with lathes, drills, grinders and other machine tools, all electrically driven. There is also a garbage destructor, 8 ft. x 22 ft. in floor space, in which all the refuse from the hotel is quickly burned.

Electric elevators are the chief reliance of the Blackstone for transportation within the building. There are six elevators driven by electric motors, four for passengers and two for presses a numbered push-button which sends the car to the floor desired. As in the case of automatic residence electric elevators, the car cannot be operated unless the doors in all shaft openings are closed.

An elaborate telautograph system forms part of the electrical equipment. There are 26 of these instruments located in the various offices of the hotel and in each service pantry on the upper floors. There is also a complete telephone equipment with an instrument in each guest-room. About 450 telephones are installed in the building, and there is a three-position switchboard on the fifth floor. All clocks are controlled pneumatically by a master clock system installed by the Hahl Automatic Clock Company. This system is entirely pneumatic in operation.

There is also one Western Union Clock in the engineer's office to check the pneumatic time system. A pneumatic tube system will also be a feature of the hotel service. Three-inch tubes are installed to carry small packages between the various departments of the hotel, in a manner similar to the familiar pneumatic delivery in department stores.

By using the telephone, telautograph and pneumatic tubes in conjunction very prompt service will be secured. Thus, if a man in a room on the sixteenth floor, say, wishes some cigars or a newspaper he calls up "Central" and gives his order. The girl at the telephone switchboard receives the call and puts

her telautograph in connection with the similar instrument at the cigar stand and also with the service pantry serving the floor on which the call originates. The cigar clerk receives a written order for the cigars, and he dispatches them through the pneumatic tube to the nearest service pantry to the room from which the order comes. The man in charge of this service pantry, having been notified in writing by his telautograph of the order, is waiting, and the cigars are at once taken by a bellboy to the guest's room. The whole operation will consume but a few seconds and by means of the telautograph there is a written record for the use of all the hotel attendants concerned in the transaction. In the same way an order for ice water may be transmitted to the service pantry, although as yet no effort has been made to deliver this indispensable hotel beverage through the pneumatic tubes. However, thermos bottles will be used in the rooms, which will keep water cold for a number of hours, so that the calls for ice water will probably be greatly diminished, to the grief, no doubt, of the ubiquitous "bellhop."

In the whole building the output of the electric motors, ranging in size from 1½ to 40 hp, will aggregate 450 hp. In addition to the motor applications already mentioned there will be motors used to operate two revolving doors at street entrances, which will be turning continuously. The centrifugal pumps for circulating brine and water on the refrigerating system are driven by electric motors, and there is also a 15-hp motor used for operating the ice-handling machinery, which is situated in the basement.

This machinery includes an ice breaker, ice-cutting machine, ice-shaving machine, ice-cubing machine and an ice-cream freezer, all driven from one shaft, to which the motor is attached. In the kitchen a wide use is made of a number of small electric motors, and these drive silver-polishing machines, a dish hoist (which requires a 5-hp motor), an electric dish-washer, dough-mixer and vegetable parer and other appurtenances of a large and modern culinary department.

The laundry is placed on the twentieth floor of the building, where it is well removed from the rest of the hotel. In every respect this will be a model plant for the handling of all classes of laundry work. An extensive use will be made of electric heat, while electric drive will be relied upon throughout. The washing machines will be driven in two groups, one consisting of three large washers and the other of three washers of medium size.

A desirable feature of this arrangement is that either or both of these groups can be operated according to the demand. One group will be driven by a 7½-hp motor and the other by a 5-hp motor. The driers, which are of the conveyor and sectional types, will be driven by a 1-hp motor. The extractors or wringers will have individual vertical motors directly connected. There are four of these machines, each having a 2-hp motor. The large flat-work ironer will be driven by 2½-hp variable-speed motor giving a difference in the travel of the machine depending on the time and quality of the goods being ironed.

Motors varying in size from ⅛ hp to 1 hp will drive individually and by direct connection the following machines: Collar-and-cuff starcher, shirt starcher, band starcher, handkerchief and underwear ironer, collar-and-cuff dampener, shirt ironer, band ironer, sleeve ironers, two body ironers and a collar-and-cuff ironer. There are a number of other machines requiring no mechanical power to operate them. Each of the ironing machines will be heated by electricity except one steam collar-and-cuff ironer and a cuff press, which are heated by steam. The small collar shapers, edgers and finishers will also be heated by electricity. All hand-ironing will be done with electric flatirons. For this large and extremely modern laundry equipment the total consumption of electricity for power will be 86 amp, while 48 amp will be required for heat. The Troy Laundry Machinery Company, of Chicago, will install the entire equipment.

A very complete vacuum cleaning plant will be installed by the Connersville Blower Company, but it will be entirely mechanical in its operation. A cycloidal blower in the basement, driven by a 7-in. x 7-in. vertical steam engine, will be connected to the piping system consisting of four risers going up through the entire building in four different locations. There are connections on each floor, of course, with each of the risers, so that all parts of the building may be easily reached for vacuum cleaning of rugs, curtains, draperies, etc.

While very careful attention will be paid to the electric lighting of this handsome hotel, the plans at the present time are not worked out so far that an adequate detailed description can be given.

There will be about 9000 incandescent lamps used, of which some will be tungsten, some tantalum and some ordinary carbon. It is quite possible that the lighting of the corridors will be on the indirect system, with fixtures throwing the light to the ceiling, from which it will be reflected for general illumination. A feature of the building will be a row of 31 standards along the roof line. Each of these standards will support a cluster of four 40-watt tungsten lamps and from their lofty position on the top of the mansard roof they will form a conspicuous feature of the building at night. Running around the building at the third-floor level there is a further line of 36 similar clusters, which will form a lower line of light. There will be four or more flaming-arc lamps placed on the street level.

The porte cochere on the Hubbard Place side of the building will be lighted by 12-lamp clusters with some ornamental lighting, which is yet to be finally determined. Throughout the various public reception rooms there will be many beautiful fixtures, and perhaps here, too, there will be indirect lighting. An illuminated display fountain will be a feature of the art-hall floor. Electric lamps in colors will present an attractive effect by shining through the water of this fountain.

In each guest's room there will be a tasteful central ceiling chandelier for general lighting and in addition a portable reading lamp placed on a table. Each dresser will be provided with two lamps fastened to the article of furniture itself and connected by flexible cable to baseboard outlets. By this means the dresser with its lamps can be moved about as desired. A feature of the guest-room lighting will be an automatic door switch supplied by the Hart Manufacturing Company. This switch is so arranged that when the occupant of the room goes out and locks his door on the outside the lamps are extinguished automatically, but the door can be locked from the inside or it can be closed without being locked from the outside without extinguishing the lamps. This is not only a great convenience to guests, but will result in a considerable saving in electricity, which is an item of some importance in a large hotel.

At the Hubbard Place entrance there will be two electric carriage calls, one placed at each end of the porte cochere. This signaling system consists of three boxes or frames containing electric lamps and covered by a glass face plate. These lamps are connected to a keyboard placed inside the entrance to the hotel and having three banks of keys. Each bank of keys contains the numerals from 0 to 9, and by pressing any one of them the corresponding figure flashes up in the box controlled by this bank of keys. Thus, to signal the number 346 the "3" key is pressed in the lower bank and successively "4" and "6" in the middle and upper banks of keys. By so doing the number 346 is outlined in electric lamps at each end of the porte cochere and is visible to all the waiting coachmen. This does away with the necessity of calling out the numbers of carriages and automobiles at a reception. The Chase Electric Company is installing this device.

The Blackstone is owned and will be operated by the Drake Hotel Company, of which Messrs. Tracy C. Drake and John B. Drake are the president and vice-president, respectively. Messrs. Marshall & Fox are the architects for the building, and their consulting mechanical and electrical engineers are Messrs. L. L. Summers & Company. Mr. F. K. Boomhower is the chief engineer of the Blackstone. It is expected that the hotel will be ready for guests Jan. 15, 1910.

Population, Consumers and Lamps.

By Alton D. Adams.

A CERTAIN single electrical supply system serves a metropolis and more than a score of the surrounding cities and towns at uniform meter rates for commercial and residence lighting. The maximum meter rate during the past year has been 12 cents per kw-hour, subject to various discounts according to the conditions of service. Records of this system show the number of lighting consumers and the equivalent number of the connected lamps, on a basis of 16-cp units, in each of the eight service districts into which its territory is arbitrarily divided. One of these districts is confined to the metropolitan city, and each of the other districts comprises two or more of the adjacent cities and towns. In the list of municipalities are some especially devoted to manufactures, some are mainly residential, and some are mainly farming districts.

Under the circumstances just detailed an exceptional opportunity is presented for the analysis of electric lighting service in a number of places that differ widely in population and in the occupations of their inhabitants. Comparisons of the numbers of lighting consumers and of connected lamps in different cities and towns are usually hampered by differences in the rates and the quality of the service, but in this instance the rates are understood to be uniform to all that are supplied with energy under like conditions. It may fairly be assumed, also, that the efforts to secure lighting business, and the quality of the service, tend to approach equality in the several places.

Figures of the 1905 census have been taken for the populations and in the metropolis certain deductions have been made for minor parts that were lighted by electric systems other than the one considered here. In the eight service districts the populations vary from 522,415 in the metropolitan city down to only 11,756 in two small towns, and the district next to the metropolis in point of numbers contained 78,940 persons. The table herewith presents the eight districts in the order of their populations, giving the number of inhabitants, the number of consumers, the equivalent number of connected 16-cp lamps, the number of lamps per consumer and per 100 of the population, and the number of consumers per 100 of the population in each.

In the totals for the eight districts are 703,597 inhabitants, 23,588 consumers and the equivalent of 1,040,713 connected lamps of 16 cp each.

To make more clear the relations of population, number of consumers and number of connected lamps, a diagram is presented for showing the population, the number of consumers per 100 of the population and the number of connected lamps per 100 of the population in each district. In the diagram each small circle represents a district, and each circle is located according to the number of its connected lamps per 100 population measured on the horizontal lines, and according to the number of consumers per 100 of the population measured on the vertical lines. Populations are indicated at the top.

POPULATION, CONSUMERS AND LAMPS IN ELECTRICAL SUPPLY DISTRICTS.

Population of District.	Number of Consumers.	Equivalent Number of 16-cp Lamps.	Lamps Per Consumer.	Lamps Per 100 Population.	Consumers Per 100 Population.
522,415	16,849	838,723	50	160	3.2
78,940	1,986	46,677	23	59	2.5
28,976	1,390	38,487	28	133	4.8
19,772	797	22,036	27	111	4.0
16,079	601	14,056	23	88	3.8
13,830	836	30,567	36	221	6.0
11,829	321	21,572	67	182	2.7
11,756	808	28,595	35	244	6.9
703,597	23,588	1,040,713	44		

As shown in the table, the average number of lamps per consumer is down to 23 in each of two districts, and up to 67 in one. It is to be noted that the district of the metropolis does not stand highest, having 50 lamps per consumer, while the next largest district with 78,940 inhabitants has only 23 lamps per consumer. The maximum number of lamps per consumer is in a district of only 11,829 inhabitants, but the largest city with 50 lamps leads all the other districts.

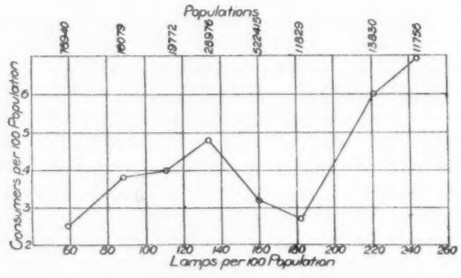
In number of lamps connected per 100 of the population the smallest district leads with 244, and two other small districts are ahead of the metropolis, which latter has 160 lamps. The least number of only 59 lamps per 100 people is found in the district with 78,940 people.

As to number of consumers per 100 persons the smallest district again leads with 6.9, and four of the other districts have more consumers per 100 than the metropolis with its 3.2. The second largest district stands lowest with only 2.5 consumers per 100 people.

With uniform rates for electric lighting in all of the above districts, it seems that the widely different ratios of consumers and connected lamps to the numbers of inhabitants must be due in large part to the local conditions, such as the character of the population, the extent of commercial and manufacturing interests, and the presence and price of gas supply.

In the metropolis of 522,415 people the commercial and manufacturing interests are very important and tend to increase the number of lamps per consumer, as well as the lamps per 100 of the population. On the other hand, a large percentage of the population is of foreign birth or very poor, and this reduces the percentage of consumers to the entire number of people. Another factor in this great city that keeps down the number of consumers is the supply of gas of about "18 cp" at the rate of 80 cents per 1000 cu. ft.

The district with a population of 78,940 includes one city and one town, neither of which is prominent in manufacturing industries. Both of these places are close to the metropolis, so that their commercial and retail business is relatively small, and they are occupied mainly as places of residence.



RELATION OF LAMPS TO POPULATION.

Add to these facts the supply of illuminating gas at 90 cents per 1000 cu. ft. in the city part of the district, and at a somewhat higher rate in the town, and there is an explanation for the fact that the district has only 2.5 consumers and 5.9 lamps per one hundred of the population, and only 23 lamps per consumer.

In the district with 28,976 people there is a city containing about one-half of this number, and the remainder are in two towns. The city has a fair number of manufactures, but they are mainly tanneries that do not require much light, and the towns are largely places of residence for people employed in the cities. Gas is distributed in the city at $1.40 per 1000 cu. ft. and in one of the towns at $1.80. This district has 4.8 consumers and 133 lamps per 100 people, but the number of lamps per consumer is at the moderate figure of 28.

Five towns go to make up the district that has the population of 19,772, and these towns have about 60 manufacturing plants, which produce machinery, paper articles and food preparations among other things. As these five towns lay 20 to 25 miles from the metropolis their population is to a large extent employed at home. Gas is distributed in only one of the towns, which contains a little more than one-half of the population of the district, and is sold at the rate of from $1.50 to $2 per 1000 cu. ft. Under these conditions 4 per cent of the population use electric light, there are 111 connected lamps per 100 of the population and each consumer has 27 lamps as an average. It should be added that there is a large farming element in the population of this district.

A district comprising seven towns has the population of

16,079, and this population is less in comparison with the included area than any other here considered. The towns lay 20 to 30 miles from the great city, where the generating plant is located, and agriculture is an important occupation of their inhabitants. There are, however, some 46 manufacturing establishments in the district that produce metallic goods, chemicals, rubber articles, food preparations and books. Gas is not supplied in either of the seven towns. This district contains 3.8 consumers and 88 connected lamps per 100 of its population, and the number of lamps per consumer averages 23.

There are 6 consumers and 221 connected lamps that average 36 per consumer in the district that contains 13,830 people in four towns. Knit goods, food preparations and books are prominent articles of manufacture in this district and it contains not less than 26 manufacturing plants. One of the four towns contains about one-half of their combined population. Gas is supplied in this largest town at the rate of from $1.20 to 90 cents per 1000 cu. ft., but there is no gas in the other three towns.

In the district with 11,829 people there are 182 connected lamps per 100 of the population, and the large number of 67 lamps per consumer, but there are only 2.7 consumers per 100 inhabitants. These unusual results exist along with the following conditions: Two-thirds of the population of this district are located in one town and this town has 47 manufacturing plants that produced goods to the value of $3,453,094 in a recent year and paid $643,613 in wages. By far the most important of these manufacturing industries is that of boots and shoes, which represented $2,896,110 of the value of products and $489,920 of the wages paid in the year mentioned. The manufacture of shoes was carried on by 13 establishments. Gas is sold in this town at from $1.50 to $1.70 per 1000 cu. ft.

The smallest of the eight service districts in point of population contains 11,756 people in two towns, but the number of consumers is 6.9 and the number of lamps 244 per 100 inhabitants, the largest relative numbers of lamps and consumers in any district. At the same time there was only the medium number of 35 lamps per consumer. One of these two towns adjoins the metropolis and is important as a suburban residence, and the district contains 31 manufacturing plants. Gas is distributed at 80 cents per 1000 cu. ft. in one of the towns, but there is no gas sold in the other.

The above results appear to support to some extent the following conclusions:

Cheap gas reduces the number of electric light consumers, but attracts only the smallest.

A large city does not surpass small places in either the number of consumers or of connected lamps per 100 inhabitants, but usually leads in lamps per consumer.

Towns show the greatest percentage of electric light consumers and the greatest number of connected lamps in relation to population, and where there are numerous manufacturing plants of moderate size a town may also lead in the average number of lamps per consumer.

Experiences of an Erecting Engineer.

By C. T. PHILLIPS.

TECHNICAL papers from time to time give descriptions of electrical and mechanical installations and the results of test and the way in which engineering problems are solved. To the layman who reads these articles it might seem that the life of an engineer is one continuous round of pleasant work, with no troubles or friction. In writing articles for the technical press, I presume the author thinks that his troubles would not interest the readers or else he does not wish to give the impression that an engineer ever has troubles. Perhaps some of them are so fortunate, if they have absolute authority, but where they are being continually advised by, or are doing work for, parties who think they know how it should be done, the engineer's troubles begin.

In the last 10 years I have handled quite a number of light, power and industrial installations in different parts of the country as consulting and erecting engineer. The majority of these installations were under 1000 hp, and as long as I had absolute control I had no trouble in producing satisfactory results. In a number of cases, however, I had anything but a pleasant time and labored under a handicap which frequently caused ill feeling and poor results, including loss of time and money.

On one occasion I was engaged to engineer the installation of a street-railway system in a small city, the maximum capacity of the power house being about 700 kw. As I was installing a commercial lighting system in another town at the time, I informed the railway people that I would not be able to be with them for about three weeks, but would get out my preliminary plans at once and put my ideas into shape, so when I did arrive no time would be lost.

In due time I arrived in the city and going to the president's office, received the startling information that to save time he (the president) had bought the power-house machinery, the car trucks, the motors and controllers. I was then shown a set of drawings of a boiler which, the president informed me, I was to build and use in the power house. On looking over the drawings I found that the boiler was very poorly designed, and I informed him of the fact. He stated that he had bought the rights to make the boiler and had named it after himself, that this type had been installed in the State Capitol, and what was good enough for the State Capitol was good enough for him.

The machinery order consisted of three simple engines, a piece of countershaft with clutch and tight pulleys, and three dynamos. I advised against the shafting, but he insisted upon using it. The countershaft had clutch pulleys which were of the wrong size to drive the dynamos, and plain pulleys for the engines. I asked him the reason and he stated that the salesman who sold him the shafting had said that in case they wished to cut out a dynamo to make repairs, or, on account of light load, they could use the clutch pulleys. I asked him what would happen if something went wrong with one of the engines, and he stated he never thought of that.

It took about two hours to explain to him that there were 50 chances of trouble on the engines to one on the dynamos; that, besides, no repairs could be made on the engine while running, nor would it be advisable to cut the steam off and let the engine run.

The usual source of trouble on a dynamo is the brushes and they could be repaired while running with the main and field switch open. In case of a burn-out the dynamo could be run dead until after shutting-down time and then the belt taken off.

The shafting was shipped back to the factory, and I turned my attention to other troubles, of which there were many, the principal one being the manufacture of the boilers and setting them into a power house that had been built with no idea of what was going into it—the boilers, consequently, had to be set at right angles to the engines, which necessitated much more piping and greater losses than if they had been set parallel to them.

The shafting was so long that the end bearings had to be set into the wall. The motors I found were larger than necessary and would not fit the trucks, so they were shipped back for others.

The power house was finally started and the cars assembled and wired, and the day arrived to take the first car out of the barn. I mounted the front platform and threw the controller on the first notch. There was a flash, and the motors bucked. I tried again with the same results. I tried the other controller and the circuit-breaker in the power house went out. I carefully examined the wiring, disconnecting it, made tests on the motors for grounds and shorts, and then carefully reconnected the controllers and found I still had the same trouble. After many tests and examinations I came to the conclusion that the trouble lay in the controllers, although the president stated that they were new. He afterward admitted, however, that he had bought them second-hand, the parties stating that they had never been used. A close examination revealed that they had been used and had been overhauled, re-

painted and rewired, and the wiring had been installed regardless of proper connections, no two being wired alike. They were all taken out and rewired, and at last the system was running. The efficiency was an unknown quantity.

I figured up roughly the last day I was there and gave the results to the president. There had been over 20 days' delay and an additional expense of about $3,500, not counting excessive fuel consumption or high maintenance.

In another case a railway company bought a new direct-connected unit for $18,000 from the manufacturer, the original cost of which was $23,000. The parties for whom it had been made refused to take it, and I found out later that it had not come up to the specifications, the steam consumption being excessive. When the railway company was offered the outfit at a reduced price (the manufacturing company stated that it would not let the parties for whom it had been made have it on account of their financial condition) the directors of the railway company bought it without consulting even their steam engineer, though knowing nothing about efficiency, steam consumption, maintenance or any other point which an engineer would go into thoroughly. Coal, in this section, cost about $4.75 per ton delivered into the power-house bunkers; consequently, quite a saving could have been made by installing an efficient generating unit.

The switchboard panel that came with the unit could not be used as it was intended for an isolated plant and had no provisions for connection to the busbars or equalizer. The board was rebuilt and the voltmeter discarded, as it was not necessary, there being one on a swinging bracket on the end of the old board.

I did not use a condenser on this unit as I found it would not pay, so used the exhaust steam for heating the feed water in an open heater. I made a detail report on the installation showing the saving that could have been made by a different installation. The report was read at a directors' meeting, but failed to meet with the enthusiasm which I anticipated.

On one occasion a commercial lighting plant in a small town was not paying, and I was employed to see what I could do with it. I found that the company was owned by an estate which was managed by a woman. The power house was in a very poor condition, the machinery being antiquated and only about half loaded. The service was very poor.

After getting the plant into shape so that the service was much better, I solicited enough consumers to load the plant up to its capacity and still had not canvassed the entire town. We decided that the plant should be enlarged and the woman who was manager came to borrow some electrical books that she might familiarize herself with the subject sufficiently so that she could buy the new machinery and superintend its installation. She expected to accomplish in a few weeks what it takes the average man, who devotes his entire time to it, five or six years. I lent her the books. A few days later she returned them stating that she did not understand them, and after that I heard no more about her engineering the new plant and I was able to follow out my own ideas without interference.

A manufacturer who by diligence had built up an immense business was going on a trip to buy machinery for a new plant. He intended to use individual electric drive, buying current from the power company. He asked me what I would charge to buy the motors for him and draw up a set of wiring specifications, and what would be the approximate cost of the motors. I gave him a figure of $150 for my fee, and told him that the motors would cost him $2,900 and the wiring $950.

After he had been away a few days I received a letter from him stating he had bought his motors and for me to let the whole matter drop. Sometime after that I saw him on the street and he invited me to look at his motors, on which he had saved $500 over the price I had quoted him. I took a look at the motors and found he had bought them from some small concern in a distant town and they were for direct current. I had figured on alternating-current motors for various reasons, one being that the power company had only alternating current in that vicinity. I mentioned that, and he said: "That is all right; I have a dynamo." I asked him what he was going to use to run his dynamo, and he stated he did not know that he had to have anything with which to run it. The next day he asked me to straighten the matter out for him. I informed him that as there was considerably more work, I would have to charge him more, and as I could not get rid of the motors he bought I would have to use them and buy a motor to run the dynamo. This motor would cost about $900, besides about $400 additional on the wiring and nearly $200 for a switchboard; then there were belts and other details I had not figured upon.

I had figured on an efficiency of 85 per cent in my proposed installation and the installation that finally went in had an efficiency of about 60 per cent. This man, to save $150 engineer's fee, spent about $1,300 in excess, besides causing an increase of over 20 per cent in current consumption and a much higher rate for maintenance and depreciation, and also increasing the fire hazard.

While acting as erecting engineer on a steam-electric central station of 20,000 hp we experienced a great deal of trouble owing to the fact that there were no plans or specifications to show in detail the wiring or the piping; consequently, it was one continuous fight between the pipe fitters and the electricians. The space was limited, and if the pipes were installed before the wires the wires suffered, and vice versa. After the plant had been running about a year, the wiring and small piping gave so much trouble that both had to be torn out and installed in accordance with a set of plans which had been prepared in the meantime to cover the details.

I must say that in the majority of cases I never had any trouble, and it is only where the engineer is not given complete charge that there is any occasion for complications like those just recited.

The Present Status of Ozone.

By G. M. Dyott.

OZONE has long been recognized as a most powerful and effective sterilizing agent, but being a very unstable gas and difficult to manufacture economically its commercial exploitation has been less rapid than what one would naturally suppose; in fact, there are few processes which, promising so much, have yielded so little considering the time they have been before the public. During the past 12 years there have been formed many companies advocating the use of ozone for some purpose or another, and it is unfortunate to relate that almost without exception failure has resulted, although in a few isolated cases a small measure of success has been obtained.

In view of the present knowledge of the art it seems that failure has been due to one or all of the following causes: Highly inefficient apparatus, ignorance of the laws governing the gas in question and the production of nitrous oxides along with the ozone which were in themselves more deleterious than the ozone was beneficial. Further, it might be mentioned that doubtful methods of financing, coupled with poor management at the hands of inexperienced men, have played not an unimportant part in hindering its successful exploitation along legitimate lines. Fortunately, to-day the tendency to look upon an ozone company as a stock gambling concern is not as great as it was, and the subject, which is one of world-wide interest, is now receiving attention at the hands of reputable engineers all over the country.

Progress in Europe has, as usual, been slow but sure, and in the purification of water the Siemens & Halske Company has done much; its apparatus can be found in all shapes and forms, from the portable military sets up to the larger units designed for municipal water works. For ventilating purpose a great deal of credit is due to the Ozonair Company, Limited, of London, which with exceptional vigor has covered this particular field in every direction with great success.

The theory and chemistry of ozone are too well known to be discussed here, but a brief summary of what has already been done with it commercially and what may be expected of it in

the future will not be out of place. The principal systems on the market to-day for producing it on a large scale are the Siemens & Halske, Otto, Vosmaer, Schneller, de Frise, Gerard, Armstrong and the Joseph. Of these the underlying principle of all is the same: a high potential discharge takes place over metallic surfaces separated by a dielectric. One differs from the other only in the materials used, the method of mounting them and the mechanical cooling devices employed. These and other minor features may seem trifling, but it is just such points which make an appreciable difference in the working results.

Up to the present time ozone has been considered chiefly in connection with the purification of water, since it has been shown that when water is thus treated it can be made absolutely sterile at a cost so small as to be incredible. In Europe a large number of communities suffering from impure water supply have availed themselves of the process with excellent results, and of the several plants installed in America one deserves particular mention since from the standpoint of efficiency and high concentration it exceeds anything else heretofore attained, either at home or abroad. The plant in question, which is located at the Homeopathic Hospital in Pittsburgh, was described in the *Electrical World* Aug. 29, 1908. The water, as received from the city mains, is particularly bad, and yet at a cost of electrical energy not exceeding 50 cents 100,000 gal. can be treated every 10 hours and rendered free of all pathogenic germs.

The production of ozone at this plant varies from 80 grams to 100 grams per kw-hour and every 100 gal. of water treated require about 1 gram of ozone. Under these conditions the concentration ranges from 6 grams to 14 grams per cubic meter of air. This is a remarkable achievement considering that it represents average working conditions on a commercial scale. The peculiar success of the Gerard apparatus can, no doubt, be attributed to the efficient method of cooling and the ingenious system of distributing the potential strains along the ozonizing tubes, thus reducing the possibility of breakage.

The next largest field of usefulness in which ozone has been introduced with success is that of ventilation. The ease with which the ozonized air can be generated and distributed, either in a single room or all over a large building, places it within reach of anyone. At the same time the initial cost is so small and the purifying of the air so effective that the day is not far distant when ozonizing sets will be as frequently seen as fan motors in summer.

As previously mentioned, the Ozonair Company has shown quite remarkable energy in developing this line of business. It has installed apparatus in some of the leading hotels and restaurants, etc., in London, and has sold an extraordinary number of small portable outfits, for which there is an increasing market.

The progressive central-station man will find here an avenue for disposing of electrical energy under very favorable conditions. Small portable sets consume from 50 watts to 100 watts according to the type and size, whereas a room measuring some 35 ft. x 80 ft. x 12 ft. would call for an expenditure of electrical power of about 300 watts. In a hotel visited by the writer in London 2 kw was more than sufficient for killing all disagreeable odors originating in the kitchen, for supplying fresh air over the entire building and for driving the fan motor. This plant was run about six hours every day, during meal times, and when once started required no attention whatever. Once a week the entire apparatus was inspected, new filter cloths inserted and fresh lime put in the dryer.

There is very little doubt that portable ozone generating sets, when properly designed, are of great value in homes or offices where the ventilation is poor. For this class of work a high concentration of ozone is not desirable; in fact, 1 gram or 2 grams per cubic meter is more than ample. The ideal ozonizer should be so designed that it always remains cold, the time taken by the air to pass through it should be as brief as possible, and a potential of over 10,000 volts is recommended. In most cases also the air should be thoroughly dried before being ozonized so as to prevent a formation of nitrous oxides. It seems that in the very interesting portable set devised by Mr. Armstrong this latter precaution is not so important, as the time of contact is exceedingly small. Moreover, this theory works out in practice for the system produces a pure and sweet ozone which is in marked contrast to the action of some of the so-called ozone machines.

To the refrigerating engineer ozone presents features of special interest. In laying out an ice plant, for instance, high economy engines could be used and a great deal of the bulky apparatus now essential for treating the water could be replaced by a simple ozone purification plant at a cost of about one-third. Moreover, the ice produced would be absolutely sterile and of much better quality. Bad odors in storage rooms could easily be destroyed by ozone, thus increasing their storage capacity considerably, and in some cases, with fruits, etc., ozonized air alone would prevent decay without the necessity of low temperatures being maintained.

The members of the medical profession, more than of any other, are slow to adopt anything new, and they cling to their old-established methods with remarkable tenacity, but it can be said with certainty that when they throw off their cloak of prejudice they will find in ozone an instrument unequaled both for the prevention and cure of certain diseases. Pulmonary troubles and diseases of the skin yield very readily to its action in quite a remarkable manner, and the writer firmly believes that time will prove it to be a cure for consumption, when administered with care, even in advanced stages.

Some time ago the writer had occasion to examine a high-frequency medical outfit used for curing skin diseases. It consisted of a large glass globe in which a high-potential discharge was taking place. The bulb upon being rubbed over the parts affected was claimed to perform wonderful cures. Upon examining the apparatus in action it was at once apparent that ozone was produced locally and it is not improbable that the real curative effect was due to a local production of ozone rather than the high-frequency current as claimed. Experiments conducted by Dr. Woolridge at the Homeopathic Hospital in Pittsburgh indicate that ozone is destined to become a great factor in the medical world.

On considering the subject one naturally wonders whether there is any limit to its field of usefulness. As a matter of fact, there is a decided line of demarcation. Ozone, in virtue of its chemical proportions, possesses certain remarkable qualities which when properly utilized are most effective. That these are capable of so many diversified applications is fortunate as well as interesting, but in appreciating this one must not forget that like everything else it has its limitations and cannot be looked upon as a panacea for all the unsolved problems of commercial endeavor.

Economical Methods of Meeting the Maximum and Minimum Demands for Steam.

By K. WILLIAMS.

IN the power house or isolated plant there are times of great demand for steam. The engineer can prepare to meet the overload by having auxiliary boilers ready to cut in on the main steam line at the proper time. The boilers should be under steam and with banked fires, and some firemen prefer to carry the banked fires at the bridge-wall so that the moment the boilers are needed the ashes may be hauled out, the fires spread and coaled and allowed to burn quickly to generate steam of the required pressure. This is not the best method, however. There is more economy in banking the emergency fires at or near the furnace doors shortly before the overload appears; the bared portion of the grate bars behind the banked fires being covered with "green" coal, and when the time arrives for cutting in the boilers the bank is spread and coaled. The hot gases from fires banked at the furnace door have a greater amount of heating surface to traverse, whereas with fires banked at the bridge-wall there is a large amount of heating surface not subjected to the action of the heated gases given off by the banked fires.

The height of the feed water in the boilers is an important

factor to take into consideration in meeting an overload or sudden demand for steam successfully. It will be found expedient to have the boilers filled up to the safe limit with water before the overload arrives. The greater the amount of feed water at this moment, the longer the boilers will maintain steam without receiving a fresh supply of feed water.

If the maximum load demands a certain number of boilers, then as the load falls off the number of boilers generating steam should be decreased and the manner of firing the boilers to be cut out should change. Instead of firing over the entire surface of the [illegible] the fireman should coal only the back of each fire to be banked. Then by the time the lowest peak of the load arrives there will be sufficient fuel at the back of each fire to insure a "safe bank" and at the same time the full benefit of the burned fuel is obtained. There will also be less ashes to haul out of the furnace and less heat for the firemen to contend with. In managing the fires in this way a considerable amount of fuel can be saved. It is not uncommon to see firemen hauling out good steaming fire composed of half-burned coal and play water on it to "kill the heat" so as to enable him to work. This kind of firing is unnecessary.

Boiler Room Economy.

By William Kavanagh.

In order to realize the highest efficiency and economy in the boiler-room the consumption of fuel and conditions under which the boilers operate are two important factors for the consideration of the boiler-room engineer. If the boilers are too small for the work, there is always more or less trouble encountered in holding satisfactory steam pressure, and if the boilers are dirty, the coal of a poor quality and the fireman not over expert, trouble will be multiplied. For these reasons the following requirements are necessary to produce economical generation of steam: Every boiler plant should, if possible, be equipped with one or more auxiliary boilers so as to permit of cleaning and inspecting one of the regular boilers at stated times. When the boiler plant is thus equipped a number of boilers can be set aside to receive a thorough cleaning and inspection, and when these operations are completed, the boilers can be put in regular service again, when another set of boilers may be shut down for an equal amount of attention. In this way sets of boilers can be alternated, insuring economy because the boilers will be free from scale and the heating surfaces clean.

The facility with which heat can traverse along and through the heating surfaces is an important item in fuel economy. A

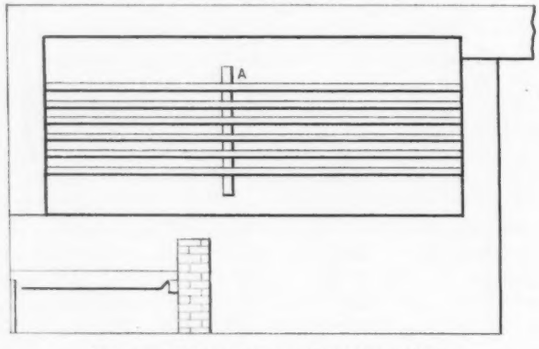


FIG. 1.—FLOAT BAR TO DISLODGE SCALE.

thin coating of scale on the inside of the boiler and a like coating of soot on the outside will retard to a large degree the transfer of heat to the water, and this means a loss of fuel. If the water contains scale-making properties, then a chemical analysis would show the best scale resolvent to pump in with the feed water to neutralize the scale and deposit it in such a manner as to make its removal easy.

The best time to blow-down boilers is after a period of rest, because the water is then quiescent and all material held in suspension falls on the crown sheet or inside the mud-drum whence a portion of it at least will run off through the blow-off valve. It is poor policy to blow-off and feed water through the same pipe, especially where a water-softening plant is not in use. When a boiler is fed and blown off through the same valve or pipe, in almost every case scale and mud will be found at the opposite end of the boiler to that in which the feed pipe is connected; hence the blow-off connection should be in the quietest and lowest region of the boiler. If the boiler is

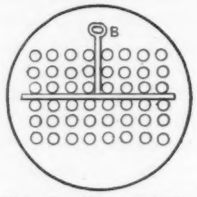


FIG. 2.—TEE-SCRAPER.

of the horizontal-tubular type a manhole connection should be provided above and below the tubes. On cleaning the tubes of this type of boiler large quantities of scale will be found between the tubes in both the longitudinal and lateral directions of the boiler. A flat bar can be used to dislodge the scale between the tubes lengthwise of the boilers, as shown in Fig. 1 at *A*, and a tee scraper or cleaner can be used to clean between the tubes crosswise of the boiler (see *B* in Fig. 2).

Another important connection to receive attention during the cleaning process is the water column, shown at *A*, Fig. 3. The plug at *A* should be removed and a rod or drill run through the pipe and a gate valve should be installed at *B* to permit this During the cleaning process the grate bars should be leveled, and broken or warped bars thrown out and replaced with good ones. The furnace lining should be looked after, the back connection cleaned out, and if the boiler is fitted with an upper flue, this should also be cleaned.

If the boiler is of the water-tube type the deflecting arches should be inspected and all broken or cracked bricks removed and good bricks inserted in their places. It is important to have the heat travel around these arches and if holes or cracks are present the heated gases from the furnace will take a "short cut" to the stack and a great deal of heat will be lost in this way. Doors are usually fitted in the side walls of the boiler setting for the purpose of blowing off the ashes and dust from the tubes. The furnace, grate bars, and flues should receive the same attention as those of the horizontal-tubular boiler.

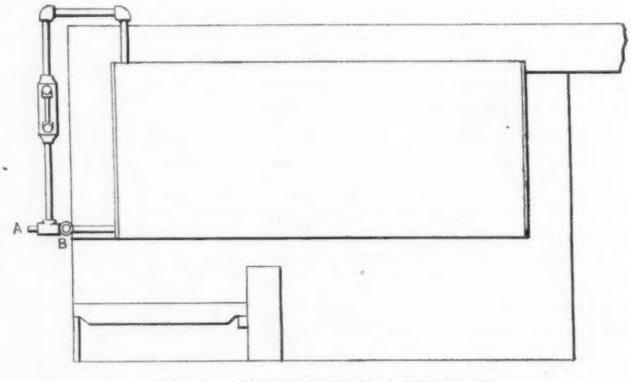


FIG. 3.—WATER COLUMN CONNECTION.

Some water-tube boilers are not fitted with side doors, connections being made for blowing soot and ashes from the tubes in the tube sheet. It is clear, however, from the foregoing that economy does not altogether hinge directly on the amount of fuel consumed, nor the ability with which coal is fired, for if the condition of the boiler is poor, then the most skilful firing cannot produce satisfactory results. Ease of access to the coal supply and facility for handling the ashes are also important considerations.

The Prevention and Removal of Boiler Scale—VI.

BY W. H. WAKEMAN.

Fig. 1 illustrates a very simple device for collecting certain kinds of impurities that would otherwise form into scale and prove both annoying and expensive. Feed water enters the upper part of the shell or is delivered through the front head

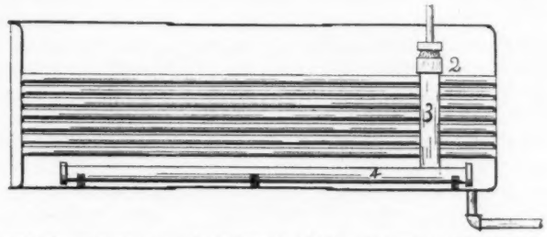


FIG. 1.—DEVICE FOR COLLECTING SCALE-FORMING IMPURITIES.

in accordance with good practice, and falls into the small tank 2. It then passes down through the narrow, flat conductor pipe 3 into the comparatively large, round pipe 4, which rests on cast-iron supports that prevent it from resting on the bottom of the shell. A narrow slit is cut in the top of this pipe, through which the feed water flows out into the body of water already there, thus preventing it from spreading until it is thoroughly heated and even then keeping it away from direct contact with the shell. The result is that nearly all impurities are retained in the lower pipe, which is called a "mud catcher." Experiments must be made to determine the length of time required nearly to fill this with sediment, in each case separately, and after this point is settled the manhole cover must be taken out and all foreign matter removed from the mud catcher within the specified time as otherwise it will become inoperative. It will be noted that this device does not remove impurities from the boiler nor change their nature and thus prevent them from forming scale.

Fig. 2 illustrates a very efficient mechanical cleaner attached to a horizontal tubular boiler. A funnel 2 is placed where the lower part of it corresponds to the low-water level of the boiler, which is generally about 3 in. above the tubes, therefore, under working conditions, the water level is at or near the widest part of the funnel, consequently a portion of the impurities which float at or near the surface enter this funnel as the body of water flows backward, and the natural momentum carries them

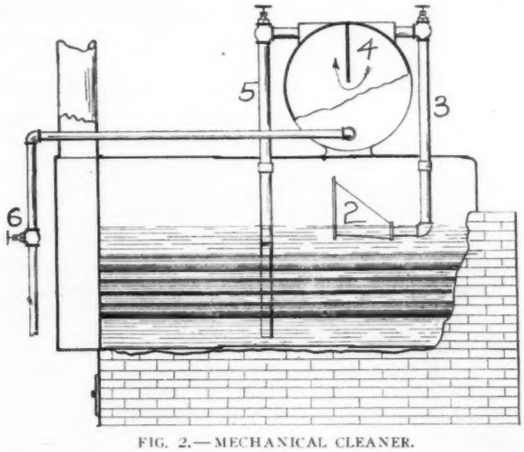


FIG. 2.—MECHANICAL CLEANER.

upward through pipe 3 into the reservoir 4, where, on account of the materially increased size of the passage and the deflector shown, they settle to the bottom while the partially purified water goes out through pipe 5 and is discharged into the lower part of the boiler. At suitable intervals, depending on the amount of foreign matter in the water, the drip valve 6 is opened for a few seconds, and sediment is thus removed from the reservoir 4. While the illustration shows this mechanical boiler cleaner attached to a tubular boiler, it is equally efficient when used on a plain cylinder, a flue or a locomotive boiler.

Fig. 3 illustrates another mechanical boiler cleaner in which impurities floating on or near the surface are caught in the skimmer 2 and are forced by the momentum of the rapidly circulating water out through the pipe 3 and into the precipitator 4, in which some of them settle to the bottom and are blown out through the valve 5. The upper part of the precipitator 4 is filled with coke, and, as this is an excellent filtering material, more of

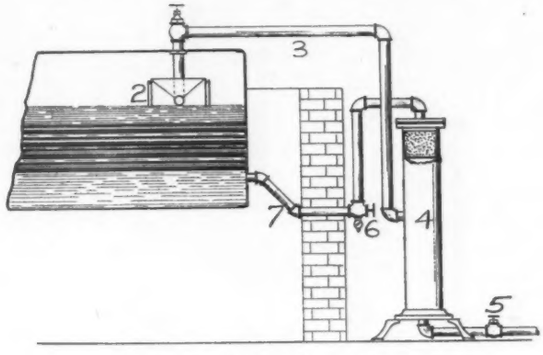


FIG. 3.—MECHANICAL CLEANER.

the scale-making impurities are intercepted by it and prevented from returning to the boiler through the cross-valve 6, which is used to regulate the flow, if any regulation is required.

Considerable care should be taken to make it impossible for a careless or ignorant attendant to close valve 6, because that would prevent circulation of water through pipe 7, and as this pipe is located in the direct path of hot gases from the furnace to the chimney, it would soon be burned off. Ashes and soot are also forced out into the room and the boiler must be cut out and shut down until repairs are completed, causing a delay that is usually annoying and expensive. The valve 6 ought to be provided with a chain and padlock, the key of which is retained by the chief engineer of the plant, enabling him to know when it is opened and closed, as it should be always open except when it is necessary to renew the coke in chamber 4. The pipe 7 ought to be protected from the intense heat by asbestos rope wound tightly around it.

Fig. 4 illustrates a somewhat similar device. The pump or

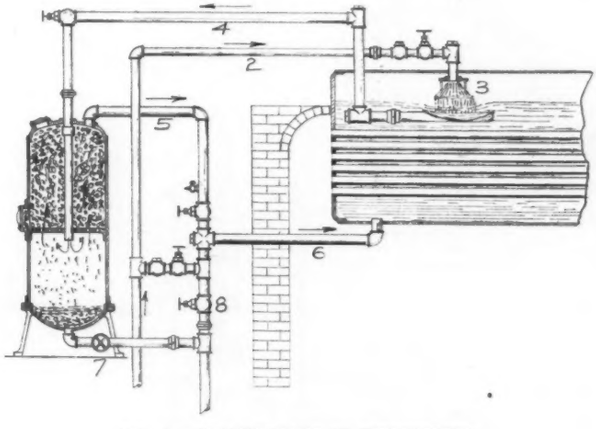


FIG. 4.—ARRANGEMENT OF PRECIPITATOR.

injector forces water in through pipe 2 into the steam space in the form of spray at 3. It is thus heated at once to a high temperature and falling into the feed pan shown is forced by momentum through the pipe 4 into the lower part of the precipitator, the upper part of which is filled with coke or other suitable filtering material. The water passes through pipe 5 and continues through pipe 6 into the boiler again. The blow-off pipe 7 is used to eject sediment out of the settling chamber and pipe 8 is the regular blow-off for the boiler.

LETTERS ON PRACTICAL SUBJECTS

A METHOD OF WIRE SUSPENSION OVER A WIDE RIVER.

It may be that what is new to the writer is also new to at least some readers, and acting upon this presumption the following description of the method used in suspending electric wires across the St. Joseph River at South Bend, Ind., is presented. Several of these suspensions are in use in that city and vicinity. The width of the river at the points of crossing is such that about 600 ft. intervenes between the suspension posts shown by Fig. 1. The sketch is made from the east

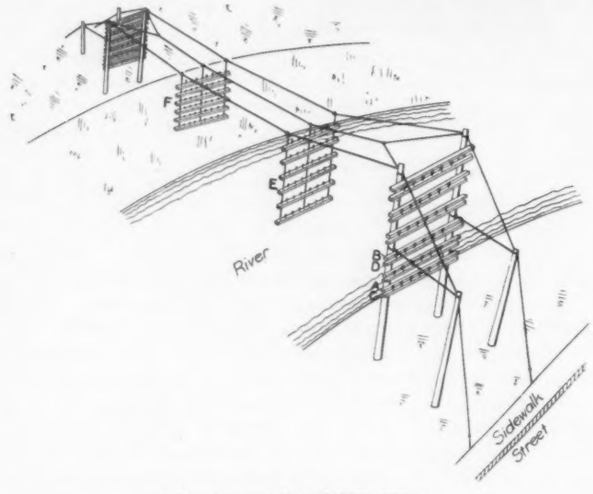


FIG. 1.—SPAN ACROSS RIVER.

bank of the river, and the east bank is from 20 ft. to 30 ft. lower than the west bank, which is rather a steep bluff. One of these suspension anchorages is so located between the river and a street and a wide canal that the anchorage space is very narrow. Another "landing" of one of the suspensions is in a public park. Another comes close to a public street and a railroad; therefore it was necessary in each instance to take as little room as possible for the guy wires, hence the intermediate shorter poles shown by the engraving in question.

For the sake of clearness, the wires have been omitted in the engravings. It will be noted that the cross-arms on the poles

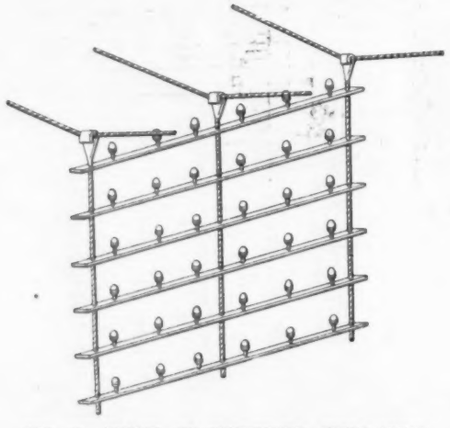


FIG. 2.—DETAIL OF SUSPENDED CROSS-ARMS.

are double; the insulators being attached to the lower arm of each pair, while the upper arms *A* and *B*, Fig. 1, serve as secure footings for the linemen, at the same time protecting the insulators on arms *C D*, and also preventing wires from falling into and becoming entangled in the insulators of any section should any of the wires break in any other section. This is a very good point, and it could be followed with advantage on many an ordinary pole where wires must be worked over and under.

It will be noted that each pair of main poles is double guyed to the short poles. It will also be noted that there is a third cable attached by means of a Y on each side of the river, to the pair of main poles. When a 24-wire suspension is arranged the middle cable is omitted, together with the pair of Y connections. In this case the middle post of rack *B* would be omitted, and the same is true of rack *E* as well. In these suspensions the cables, which are ½ in. in diameter, are simply wrapped around each post and made permanently fast thereto. It would seem an improvement—to the writer at least—were a turnbuckle added, close to each pole, for the more convenient adjustment of the cables. It must have been quite a task to tighten the cables to exactly the right tension and then hold them there while made fast, and not have either of the racks hang out of plumb when the "come-along" tackle was removed from the suspension cables. Some turnbuckles, either in the main cables or in the "deadman" cables, would seem advisable. The turnbuckles could be placed close to the ground and still control the vertical line-up of racks *E* and *F* with ease and with certainty.

When a 24-wire suspension is required, the middle cable is omitted as stated, also the center post of each rack, and the two lower crossarms are also omitted from each rack. Fig. 2 represents the manner of construction employed in the racks. The upper end of each post is made from flat bar steel and is simply bent over upon itself, leaving just room enough that it may be hung upon a cable. Just below the hooks the flat steel is cut off and a threaded rod welded on. The holes in the rack cross-bars—these are also plain flat bar iron—are threaded, and the posts are simply screwed into threaded holes in the cross-arms.

A little care is necessary to enter each cross-arm at the exact distance required from the arm immediately above it. But once entered at the required distance from the preceding cross-arm, no further attention whatever is required in assembling the rack, as it is then impossible to get the arms out of place after the posts have once been entered in their respective holes.

The insulators are also attached to the bars by means of plugs which are screwed into the arms as shown. After the rack is in position upon the cables, the flat upper ends of the posts may be closed down upon each other with the certainty that the cable can never slip out even if it breaks in two between racks or posts. As the insulators are directly attached to a well-grounded metal arrangement, it would seem that extra good insulators should be employed, and those of the "high-tension" type would be in order to make an extra good job.

South Bend, Ind. James F. Hobart.

BOILER SCALE AND THE REMEDY.

To the engineer or station manager who has hard feed water to contend with, the effect and prevention of scale in boilers are matters of interest and importance, as the presence of scale resulting from use of such water may be a source of much loss and worry. It might be stated in the beginning that all available sources of boiler feed supply should be looked into when a plant is first installed, and that supply most suitable selected. However, at times all water available may be hard, containing lime and magnesium salts, in which event scale formation in the boilers is a foregone conclusion unless some step is taken toward its prevention. Presence of scale is not only a menace to the safety of the boiler itself, but the efficiency of the boiler is thereby impaired to an extent varying directly with thickness of scale present. It is estimated that a thickness of 1/16-in. scale is equivalent to a loss of from 15 per cent to 20 per cent of fuel; a thickness of ¼ in. to a loss of 60 per cent. It can therefore be seen that scale prevention is a matter of dollars and cents to the station manager. Aside from

the foregoing, a scaly boiler is liable to be burned at any time with the resulting formation of a bulge or sag in the plates. The scale being a non-conducting covering allows the portion of boiler exposed to the fire to be overheated, no water coming in contact with metal to cool it. A bulge results which at best means a patch on boiler. Scale also causes a great deal of trouble by stopping up pipe connections, gages, etc., and in some instances boiler explosions have been attributed to its presence, indirectly. Turning to scale formation one finds that solid matter may be contained in feed water either in suspension or solution. That contained in suspension is not, generally speaking, of much concern to the engineer, as it may be disposed of by filtering water prior to its entrance to boiler, or, if this should be impracticable, by frequent blowing off. The matter entering the boiler in solution is that of prime importance, as it is from this that the most objectionable scale is formed. Carbonates of lime and magnesia and sulphate of lime are soluble in water, and it is these salts that are most often found in feed waters. The carbonates are precipitated on boiling and have little cementing tendency, so if they alone are present little trouble is experienced. But the sulphate of lime is usually present also, and the carbonates seem to crystallize along with the sulphate, both adhering closely to boiler shell or tubes. Scale thus formed is usually of a white or grayish color, is very hard and dense, and is hard to remove. Such scale may be removed from the water by chemical reactions prior to its entrance to boiler, or may be taken care of in boiler itself. Where there is a condensing plant the same water may be used over and over again by proper use of surface-condensing apparatus, but where the installation is non-condensing the best procedure is to install open feed-water heaters or lime catchers, of which good types are on the market. Such a heater will dispose of nearly all the carbonates in solution as these are precipitated near the boiling point of water. The scale forming in the heater is readily removed. The heater will not take care of the lime sulphate in solution and in order to remove this or to change it into a harmless form, some reagent must be used on the water. It is sometimes found that the use of mechanical reagents like sand, malt grains, saw-dust, etc., in boilers, prevalent in some sections, prevent the formation of scale on boiler shell by offering their own surface for deposit. The use of kerosene is also very common throughout the country. The action of the oil is entirely mechanical, scale being loosened by its penetrative qualities. While the remedy is cheap and to some extent an effective one, the writer believes from experience that the use of kerosene causes about as much annoyance as scale itself. It will cause leaky joints and a general pitting throughout the entire steam system. It will dilute cylinder oil and at best is only a partial remedy as much scale will be left behind. Possibly the best remedy for the sulphate scale is to see first that the water enters the boiler at its coolest point, which is probably two-thirds distance from front to back of boiler, and a few inches below water line, in a return tubular boiler. Scale deposited at this point will be less harmful than elsewhere. A safe boiler compound should then be adopted that will act chemically on the precipitate, changing its solidifying character. The compound should be introduced, if possible, into an open feed-water heater and taken thence to the boiler. If the compound is effective both heater and boiler will be benefited. One should make use of soda ash as a boiler compound with great caution. The effect is the same as that of concentrated lye on packings, gaskets, and brass connections. Good results can be secured by use of some of the vegetable feed-water compounds. Such a compound should free the boiler from scale and keep it clean, in no way damaging the metal. A handy arrangement for feeding compound to the heater may be had by locating a barrel at somewhat higher level than the top of the heater and in a readily accessible position; a hole should then be tapped near the bottom of the barrel and also near the top of the heater and the two connected by a small pipe through a globe valve and check valve. The necessary amount of compound for a day's run may be mixed in the barrel and the feed to the heater regulated by a globe valve.

WASHINGTON, N. C. P. A. TILLERY.

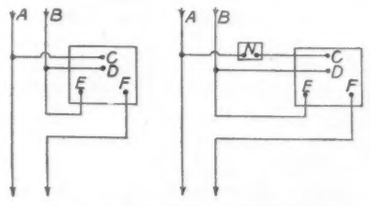
METER CONNECTION ON ALTERNATING-CURRENT SYSTEMS.

The measurement of power on an alternating-current system requires the use of a wattmeter, since the curent does not bear a fixed relation to the load as in a direct-current circuit, unless the power factor is unity. In nearly every system the power factor varies as the character of the load changes, and a wattmeter gives the true power regardless of any change in the power factor. On alternating-current systems there are two types of meters in general use, namely, the wattmeter and the watt-hour meter. The wattmeter gives the load at any time, but keeps no record of it. It is used for generator or feeder circuits and sometimes on main busbars or, in any case, where it is desired to note the load at different intervals of time. The watt-hour meter gives the load during the time and is constructed on the principle of an induction motor, the speed of which varies with the load passing through the main circuit. A worm on the shaft operates a train of gears, and a reading is obtained from pointers moving over dials; hence a reading may be taken at any time; the difference between any two readings gives the energy that has passed through the circuit during the time between the readings. The speed of the pointers is arranged so as to give a reading directly in watt-hours, or, multiplying the reading by a "dial constant," the result will be watt-hours or kilowatt-hours. This type of meter is sometimes used on generators, and it should always be used on the main busbars to give the total output of the station, and also on the service line of all customers. There is also a curve-drawing wattmeter made, but it is not in general use. Connections for all types are practically the same, and all types are made either for single or polyphase circuits.

For a single-phase system one single-phase meter is required. For a two-phase, a monocyclic or a three-phase system, two single-phase meters are necessary. A polyphase meter is simply two meters combined into one instrument. The two revolving disks are attached to one shaft, and the connections are exactly the same as for two single-phase instruments.

For circuits of 100 amp or less and a low voltage, the current coils of the meter can be made to connect directly in series with the circuit. However, with higher voltages it is undesirable to bring the circuit to the instrument, hence series and shunt transformers are used. Instruments to be used with series transformers usually have the current coils wound for 5 amp at full load. For tensions over 400 volts shunt transformers are used, and therefore meters may be used on circuits of any current-carrying capacity or voltage.

As the dial constant of a meter takes into account the ratio of the transformers, the meter should always be used with its own transformers, or if others of a different ratio are used, a new dial constant must be calculated. Fig. 1 shows the connections for a meter on a single-phase system, without transformers. *C* and *D* are the terminal studs of the potential coils, and *E* and *F* of the current coils. In this case the entire current



FIGS. 1 AND 2.—CONNECTIONS OF SINGLE-PHASE METERS.

of the circuit passes through the meter, and the potential coils are connected directly across the circuit. The voltage for which they are wound must be the same as that of the circuit. The resistance of the potential coils is high to limit the current flowing through them to a very small figure. Usually

it is necessary to connect a high resistance in series with the potential coils, and this resistance is sometimes placed inside the meter, or it is put in a separate case. When the resistance is external the connections are as shown in Fig. 2, *N* being the high resistance which must be connected in series with the potential coils. Fig. 3 shows the connections when series and shunt transformers are used, and an external high resistance, the primary of the shunt transformer being directly across the circuit. For a two-phase, four-wire system the connections are precisely the same, using a single-phase meter on each phase. The connections of two single-phase instruments on a two-phase, three-wire, a monocyclic or a three-phase, three-wire system may be represented in one diagram, if the proper arrangement of wires is observed. In the case of a three-wire, two-phase system the wire common to both phases should be the middle wire. In the monocyclic the middle wire must be the teaser, and in the three-wire, three-phase system it makes no difference which wire is considered the middle one. Fig. 4 shows the proper connections; *C-D* are the terminals of the potential coils and *E-F* of the current coils of one meter, or one element of a polyphase meter, and *G-H* and *I-J* of the other.

It is important to have the potential coil connected across the phase *A-B* for the meter or element that has its current coil connected to the series transformer in line *A;* likewise the meter or element connected to the series transformer in line *C* must have its potential coil connected across phase *B-C*, as mentioned before in a two-phase system. *B* must be the common return; that is, the line common to both phases. In a monocyclic system *B* must be the teaser; but in a three-wire, three-phase it is immaterial which wire it is. *N* and *O*, Fig. 4, are the high resistances to be connected in series with the potential coils of the meters. Eight wires between transformers and meters can be used if necessary; that is, separate wires to stubs *D, H, F* and *J*.

If ammeters are to be connected in to ascertain the current flowing in one or all of the lines, they can be cut in at *K, L* or *M*. That at *K* will indicate current in line *A;* that at *L* the current in line *C*, and that at *M* the current in line *B*. For ammeter at *M* to give the correct value of the current flowing in *B*, the series transformers must be connected up exactly as shown; two similar terminals must be connected to the common wire.

Voltmeters can also be connected across *R-S, S-T* or *R-T*. The voltmeter connections can, of course, be tapped on at any point of the circuit, except one wire must be on the side of the high resistance toward the transformer. For instance, one wire can be tapped on at any point of the wire *S-D*, but the other must be between *R* and *N*. The primary taps of the shunt transformers should be connected to the main circuit on the side toward the generator from the series transformer, so the current consumed by them does not pass through the series transformers. Overload relays for opening the circuit in case of trouble should have separate series transformers, except where indicating wattmeters or ammeters are used and a slight error in the reading is of no consequence. But for watt-hour meters, where accurate readings are of importance, relays should always have their own series transformers.

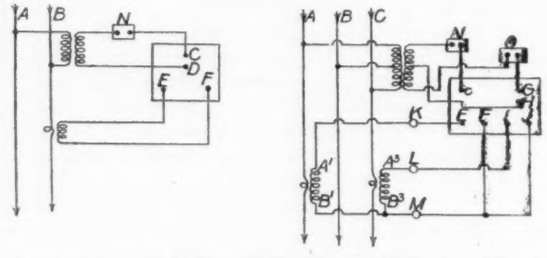
Owing to the construction of the series transformer, it operates normally with its secondary on a closed circuit of low resistance, or practically short-circuited. When the transformer is carrying load, its secondary circuit must not be opened, or the transformer will heat up to such an extent as to destroy the insulation on its coils. There will also be a high voltage impressed on the secondary circuit if the main circuit is carrying full load, and this voltage may be high enough to break down the insulation. It is also possible to receive a severe jolt if one should accidentally touch the secondary circuit when it is open. In testing the meters after they are in operation and it is necessary to disconnect the current wires, this circuit should first be short-circuited before removing the wires from the studs.

Usually, there is an arrow on the front of the meter case, which indicates in which direction the disk should rotate. If there is not, the proper direction of rotation may be ascertained by removing the case and turning the disk by hand, noting if the pointer on the dial starts moving in the right direction. After the meter is connected up, if the disk does not revolve in the proper direction it can be corrected by transposing the wires to the potential studs. If it is not convenient to transpose these, the ones to the current studs can be changed, and that will produce the desired result; but if both pairs are transposed the meter will not reverse.

In making this test on a polyphase meter, one element should be disconnected while the other element is being tested. Each element will then tend to revolve the disks in the proper direction. For this test the power factor must be higher than 0.50, as at this value the one meter or one element of a polyphase meter will stop, and at less than 0.50 it will reverse and run backward.

The foregoing also applies as well to single or polyphase indicating meters; the pointer should move over the scale, and if it tends to go backward against the pin at the zero mark, one pair of wires must be transposed.

For new work the switchboard panels come already drilled



FIGS. 3 AND 4.—METERS ON SINGLE AND POLYPHASE CIRCUITS.

for the instruments, but in mounting new instruments on old switchboard panels, holes must be drilled for the studs. The instruments should be located in the best position so as to improve the appearance of the panel. Usually a paper template accompanies the meter showing the exact location and size of the holes. This paper template can be pasted on the marble or slate in the exact position to be occupied by the instrument. The holes should be drilled as true as possible and can be a little larger than the studs, at least 1/16 in. Great care is necessary in starting the drill; generally it will save time to drill through first with a small drill, say, ⅛ in. The larger drill will then cut much faster and will not be so liable to run off center. When this occurs it must be corrected before the body of the drill enters the marble or slate. In laying out the position of the holes when a template is not used the centers should be marked with a prick punch and a line showing the edge of the hole scribed around the punch mark. If the drill runs off center it can be drawn back by cutting out with a fine chisel a little of the marble on the side of the hole toward which it is desired to draw the drill. Marble will drill faster by grinding the drill with more clearance behind the cutting edge than is used for metal. It is also best to dip the drill in water frequently; the dust will then form a paste and can be wiped off the drill. Thus the fine dust will not get over other instruments.

For satisfactory service a watt-hour meter must be set level. There is generally a planed surface on the top of the frame to lay a small level on. It is also possible to level a meter very accurately by placing a small piece of solder or lead on the disk near the edge; when level the disk will stay in any position, but if not level it will turn and come to rest with the weight at the lowest side. If the holes are not true it may be impossible to shift the meter to a level position; then the holes should be enlarged with a rat-tail file until the meter is level.

A wiring diagram should be made of the shunt and series transformers; also of the meter terminals, properly connected, marking each terminal with a number or letter. The number

of wires necessary should be measured off and cut, and each wire should be togged at each end so that any individual wire can be easily picked out. To make a neat job the wires can be pulled into a piece of loom or flexible conduit, or they may be taped into a cable and supported in position. The connections at each end can now be easily and quickly made with practically no risk of error. Tags can be made of a small piece of tin or thin sheet metal about ½ in. square with a hole punched in one corner and tied to the wire. The tags can be stamped with a letter or number, or a definite number of punch marks made on each pair.

PHILADELPHIA, PA. F. E. CONRAD.

LOSSES BY CARELESS FIRING, IRREGULAR WATER AND DIRTY BOILERS.

When the load on boilers is constant, the consumption of coal will be constant and regularity in firing and care of fires becomes a necessity. Irregular firing in such a case would mean loss of fuel and large fluctuation in steam pressure. Coaling over the entire surface of the fire is a loss; not only does a large portion of the gases escape unconsumed, but the boiler and furnace are cooled and remain so until the fresh bed of coal becomes incandescent, when the furnace and boiler will again become hot and steam will be generated. A loss also occurs from coaling one side of the furnace heavily and permitting the other side to burn down low, the uncovered or weakened side of the fire not being capable of igniting the fresh layer of coal until large quantities of gas have escaped. Hence no heat will be imparted to the boiler from the weakened side for a considerable time, thus causing the pressure to fall so that more heat will be required to raise the pressure to the original point. In such a case as this the loss is augmented by reason of the damper being kept wide open in order to have the weakened side burn its coal. Losses from dirty heating surfaces are just as great as the losses incurred by careless firing. When the tubes and shell of the boiler are allowed to get dirty or become covered with soot and ashes, the quantity of coal necessary to do the work under ordinary clean boilers can with dirty boilers readily increase from 50 per cent to 75 per cent. When the height of water in the boilers is allowed to fluctuate, losses also occur. It is a mistake to think that the carrying of low water will be an aid to economy in the generation of steam. In fact, the reverse is quite true; the higher the water is carried in the boilers the greater will be the amount of stored heat and, therefore, the boilers will be more capable of furnishing the required volume of steam for a greater length of time, thus enabling one to meet and more safely overcome the peak of the load throughout its duration. The heat of the average feed water is not above 208 deg. Fahr., and if the pressure carried is, say, 100 lb., then each pound weight of water pumped in the boiler or boilers must absorb considerable heat before it can form steam at that pressure; hence maintaining the level of the feed water at or about a fixed point in the gage glass is conducive to economy. Losses occur from leaky walls, flues and uptakes, dirty ash pits, leaking, safety and other valves. Leaks in the walls of the boiler setting can easily be located by taking a torch and passing the flame along each suspected hole or crack. If a leak is present the flame will be sucked in toward the boiler. It is almost needless to add that all cracks and holes should be promptly filled with fire clay or cement, and if fire clay and cement are not at hand asbestos cement will do the work nicely.

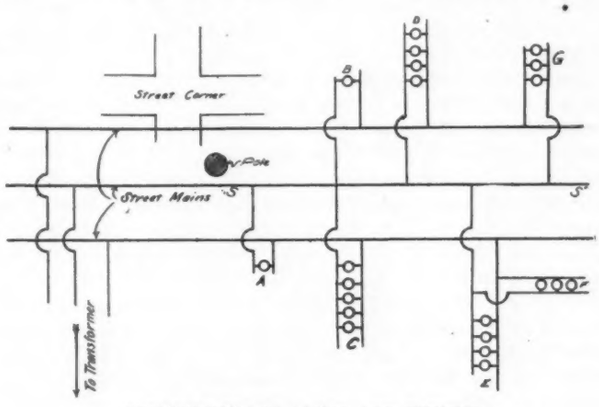
SAN FRANCISCO, CAL. JOHN HAINES.

AN OBSCURE FAULT IN A LIGHTING CIRCUIT.

Failure on the part of the lineman to make some very simple connection properly in an electric circuit may cause considerable trouble, by reason of the difficulty sometimes experienced in locating the source of the disorder.

The writer recently installed an alternating-current lighting system in a town where up to that time direct current had been used. The old system supplied 110-volt service near the power house, the load here being connected between the middle and either of the outside wires of three-wire mains; further away the middle wire of the street mains was left off and 220-volt lamps were used. When the new plant was put in it was desired to establish 110-volt service over the entire town. Hence three leads were run from the low-voltage side of the transformers to the old street mains and a middle wire was installed wherever these mains had previously consisted of only two wires. What happened on a part of this circuit may be best understood by reference to the accompanying diagram.

In the old direct-current line there were three wires as far as the pole shown at the street corner in the diagram. A middle wire was put in at *SS'*, the lamps being connected as indicated. A lineman, who was sent to put 110-volt in place of the 220-volt lamps on this circuit and to connect the middle wire at the corner pole shown, found the building at *F* locked, and hence the high-voltage lamps were not taken out at this place. That night the incandescent street lamps at *A* and *B* burned properly, as did also the lamps in the residences at *D*, *G* and *E*. As was to be expected, the 220-volt lamps at *F* were barely red. At *C*, however, one lamp at a time could be burned, but when all were turned on the lamps barely glowed at all. The wiring of this house was gone over carefully and found to be in good shape. The next day the line was ex-



ARRANGEMENT OF LAMPS AND CIRCUITS.

amined and it appeared to be all right. The following night the lamps on this circuit, except those at *C*, which were reported as refusing to burn at all, were quite unsteady. Those at *B*, *D* and *G* fluctuated slowly all the time from a dull red to excessive brightness. On the next night the lamps at *E* went gradually out and all those on the other side of the street mains burned out. When on the morning following the current was turned on for the purpose of testing out the trouble the voltage at *E* was found to be zero and that at *G* approximately 220. Opening the entrance switches on the buildings at *C*, *E* and *F* took the voltage off entirely at *G*, and hence it became apparent that there must be a break somewhere in wire *SS'*, a result that had been carefully considered two days previous. A second examination of the circuit disclosed the fact that in tying the middle wire of the old street mains to the insulator where it was dead-ended at the street corner a very long tie wire had been used. The lineman had connected the wire *SS'*.

A puzzling thing about this case is that some of the lamps on the circuit under consideration burned in the normal way for awhile. Probably there was at first a conducting contact between the tie wire and the end of the old main; and the swaying of the wires in the wind may have caused the lamps to burn with the fluctuating brilliancy observed on the second night they were used, since such swaying would make the resistance of a loose contact variable. When this contact was destroyed the middle wire was connected to the outside wire on side *A* of the mains through lamps at *C*, *E* and *F*, thus putting the voltage of the outside wires on the other side of the circuit and burning out the lamps on that side. However, just why the lamps at *E* burned when those at *C* would not is not apparent.

CHAPEL HILL, N. C. J. E. LATTA.

QUESTIONS AND ANSWERS

Can two individual wattmeters be connected to show accurately the power being expended in an unbalanced three-phase, four-wire circuit? E. A. T.

That two wattmeters may not register correctly the power used in an unbalanced three-phase, four-wire circuit will be evident when it is recalled that the current coils of the wattmeters may be connected in two of the outer wires, while all of the load may be between the third outer wire and the neutral. Under the conditions assumed herewith, the wattmeters would register zero, although, of course, a considerable amount of power might be expended in the single-phase circuit. In order to measure correctly the power in the four-wire, three-phase system, it is best to use three wattmeters, the current coil of each meter being connected in one of the outer wires, and the potential coils of the meters being joined between the neutral point and the three outer wires in which the individual current coils are connected.

What is the Pauling process of electrothermal oxidation of nitrogen? H. H.

In the Pauling process air is directly burned in the arc produced between two electrodes of the horn type, well known in lightning arresters and often used for effecting the combustion of nitrogen. The arc travels up the two electrodes from the narrowest part of the gap until it breaks off, to be renewed the next moment. Air is blown into the gap from below and spreads the arc out. As arcs of several hundred kilowatts and 1 m in height have to be started at a high potential, which sinks abruptly when the arc is re-established, a special starting device is needed. This consists simply of two blades, which pass through the narrowest portion of the gap, at the point where the electrodes are slotted and bent. These blades approach one another in the vertical plane, when the milled heads at their insulated ends are turned. The ends of the blades are cut off at 45 deg., so that two sharp points face one another in the gap. The electrodes are made of iron; the horns are said to last 200 hours, and the blades somewhat less. Each furnace comprises two arcs burning in adjacent compartments, which are oval in vertical section. A furnace absorbs 400 kw at 4000 volts, and is fed with 600 cu. m of air per hour. The arcs, broad irregular flame sheets, are said to burn very steadily. The air is withdrawn above, cooled and reintroduced laterally into the upper portion of the flame.

How can slate switchboards which have been burned be cleaned? W. H. B.

The damaged portion should first be rubbed down with sandpaper. This should be followed by a coat of good filler which must also be a non-conductor of electricity. When dry, all uneven surfaces may be evened up by the application of a good, hard-drying putty. The surface should then be rubbed down with rock pumice stone, cleaned and painted with two coats of color, followed by two coats of japan varnish which when dry may be polished in the usual way. Butter of antimony and raw oil make a good polishing medium.

It is desired to find the proper size of conductor for a three-wire underground cable allowing 3 per cent drop. The total distance from the transformer to the end of the circuit is 1000 ft., and 110-volt, 100-watt tungsten lamps are to be spaced approximately equal distances apart. Would the following formula apply: Circ. mils. = (10.8 × twice the distance × I × 100) ÷ (per cent × E). I understand that where wires in cables are carrying near their capacity, it is necessary to figure the reactance and impedance on alternating-current systems. G. J. N.

When lamps are uniformly distributed along the circuit the voltage drop at the end of the circuit is just one-half as great as would be the case if all of the lamps were concentrated at the end of the circuit. This fact allows one to determine the size of circuits for uniformly distributed lamps with a considerable degree of simplicity. In the case mentioned a 3 per cent drop from an electromotive force of 220 volts would be 6.6 volts. With a current of 10 amp concentrated at the end of a circuit, the total resistance of the circuit could be 6.6 ohms. However, when the lamps are uniformly distributed the total resistance can be 13.2 ohms. The circuit having a total length of 2000 ft., the resistance per 1000 ft. should be 6.6 ohms, or a No. 8 B. & S. wire should be selected for the outside conductors. In almost no case is it necessary to calculate the reactance and impedance when cables are used for wires transmitting electricity to lamps.

We have a number of four-pole, 550-volt motors which occasionally give us much trouble owing to flash-overs. What would cause this and how may it be remedied? O. S.

The usual causes for flash-overs are weak fields due to insulation rotting from the wires, or other defects which cause a shortening of the field circuit; and brush holders not spaced to cover the exact number of bars or placed to one side. The brushes should point exactly to the center of the armature shaft so that as the commutator wears they will not be thrown out of line and cover the wrong bars. Proper care should be taken in winding armatures to get the commutator bars perfectly lined with the slot in the armature core and to connect the proper lead from the coil to the proper bar in the commutator. With the coil lead one bar either way the same effect is produced as though the brushes were a little to one side, causing the brush holders to flash over.

Would a storage battery operating in conjunction with a power house having moderately fluctuating loads offer any advantages or show marked economy? J. S. G.

In a small plant with few units, a battery is oftentimes useful for carrying peak and light loads and for a standby in case of accident to the generating equipment. In large stations, batteries are used to take momentary fluctuations, peaks and sudden demands. Very often they are installed as a guarantee against interruption to service, and this of itself outweighs all question of cost and economy.

What effect has the specific gravity of the solution on the e.m.f. of a storage battery? C. A. O.

The e.m.f. of a lead, sulphuric acid cell varies with the specific gravity of the acid of a charged cell; but averages about 2 volts per cell. For a variation in e.m.f. from 1.9 to 2.1 volts the specific gravity variation is from 1.05 to 1.3 and between these limits the variation of voltage is gradual; but outside the limits the voltage varies much more rapidly than the specific gravity.

Why is it that the generators attached to turbines have larger air gaps than those driven by reciprocating engines? L. A. J.

The number of poles on a generator for a given frequency varies inversely as the speed; consequently there are not so many poles in turbine-driven generators as in reciprocating engine-driven machines. Therefore, the former machines have a very large number of armature ampere turns per pole and this gives rise to a large armature reaction. In order to lessen the effect of this reaction, a large air-gap is necessary.

At various times I have experienced disagreeable odors in the neighborhood of mercury-vapor lamps. Is this imaginary, or if not, to what may it be attributed? T. W.

The odor has hitherto been attributed to the ozonization of the air around the lamp by ultra-violet rays. Experiments, however, have recently been made which do not bear out this impression. The cause of the smell has been found to be due to the excitement of the olfactory nerves due to the electric charges of the ionized air round the lamp. This was proved experimentally by passing the air removed from the neighborhood of the lamp through an earthed metal tube in which the ions were discharged. The gas issuing from the tube was odorless; but when a glass tube was substituted for the metal one, the odor persisted.

Does the glass cover of an electric instrument ever exert an influence which might render it erroneous? D. B.

Instruments like galvanometers, having a long pointer near the glass and a feeble directive force, may be influenced considerably in dry weather by simply rubbing the glass. Oftentimes delicate instruments in a dry, warm room are caused to indicate erroneously when touched by the dry hand. The trouble is due to the static charge on the glass and while the deflections so produced are not lasting they may be obviated by simply breathing on the glass before using the instrument.

CENTRAL STATION

MANAGEMENT, POLICIES AND COMMERCIAL METHODS

Flat Rate for Porch Lights.

The Los Angeles Gas & Electric Company has inaugurated a new system which is meeting with considerable favor among its clients. This is to charge 70 cents per month for an 8-cp light burning all night on the porches of private residences. This light is a protection against burglars, and has been very popular with the residents of Los Angeles. The charge is so reasonable that hundreds of consumers have taken advantage of it, and it is entirely outside of the ordinary lighting bill.

The Grounding of Widely Extended Distributing Systems.

BY J. A. SEAGER.

In small central-station systems covering a comparatively restricted area it is a quite simple matter to arrange that all non-potential portions of the system shall be sufficiently grounded. This is done by placing an adequately large earth plate at the generating station in damp ground or a coke pit placed in the soil, and connecting up the framework of the switchboard to the earth plate. The lead covering of all cables brought to the board is then connected to the framework and thus an efficient earth is provided for every portion of the system.

Where, however, the distribution system extends perhaps over several square miles the potential difference between various portions of the earth itself becomes of increasing importance, and much more attention has to be paid to the matter. In a system of this sort in Great Britain containing a considerable number of substations at which the high pressure obtained from the generating station was transformed down to a suitable pressure, the covers of all the cables entering the substations were earthed at their respective substations in the manner indicated above. It was found, however, by the jointers employed upon the system that this manner of earthing was not sufficient, inasmuch as it was occasionally possible to get considerable shocks from the lead cover of the cable to earth. The matter was given attention and upon voltmeter testing it was found that there was a considerable difference of potential between a cable cover earthed at one station and that earthed at another substation. Numerous cases were found in which the continuity of the earth covering was broken at a street box. The trouble from this cause was so severe and the possibility of corrosion due to electrolysis was so dangerous that it was found the only way to effect a permanent cure was to link up all the substation earth plates with a special ring main of cable, thus equalizing the potentials between them and practically forming one big earth plate in place of about 15 separate earths.

Watt-Hour Meters.

In a paper read at the recent convention of the Colorado Electric Light, Power & Railway Association, Mr. F. P. Cummins, of the Denver Gas & Electric Company, gave much information concerning the practical operation of watt-hour meters.

The author stated that the modern types of meters were preferable to the older types by reason of improvements introduced to render the meters permanently accurate. The friction of the bearings supporting the moving element and the aging of the permanent magnets are the greatest factors that effect the accuracy after an extended period of use. The several other factors, such as frequency, voltage and temperature variation, cause only slight errors in the later type of meters. In a certain make of meter, within the past few years, there has been an increase of 300 per cent in the driving torque without an increase in the weight of the moving element and with only a slight increase in the shunt-circuit loss. After running for 5,000,000 revolutions the bearings on the modern type of meter show no appreciable wear.

As an indication of the monetary value of the loss in the shunt circuit it is to be noted that the actual cost of keeping a meter excited with energy at 1.5 cents per kw-hour at meter is about 2.25 cents per single-phase meter per month, or about $22.50 per thousand meters installed per month. The series coil loss is very small and varies with the load. A 10-amp meter may have a drop across the coils of 0.1 volt at full load on the meter.

The Denver Gas & Electric Company makes nearly all tests on meters in the shop. Series of tests are made from one-tenth to full load, after which an experienced meter man can tell where the trouble is if error is found. When the part supposed defective is repaired the meter is set and tested for light-load adjustment and for full load. No regular tests are made on the power-factor adjustment. Three-wire meters are tested on one side at a time, thereby giving the conditions of maximum unbalancing of load. Three-phase meters, which are simply two meters operating on one shaft, are tested with both potential coils and one current coil excited at a time. A fact worth noting in regard to this type of meter is the care that should be taken to keep each unit of a three-phase meter accurate rather than the sum of the two. If this point is not observed, the error on loads of any power factor other than unity will be governed by the element moving the faster.

Some months ago a test was made on the effect of change in power factor upon some of the older type of meters in comparison with one of latest design. The old-type meter was provided with a device for power-factor correction, but it was found that by closing the short-circuited turns the potential field became unbalanced to such an extent that creeping followed. The new meter was found to be without appreciable error from unity to 35 per cent power factor at one-fourth load, while the older type ran 30 per cent slow on 40 per cent power factor, 20 per cent slow on 60 per cent power factor, 12 per cent slow on 80 per cent power factor; at unity power factor, however, it was correct.

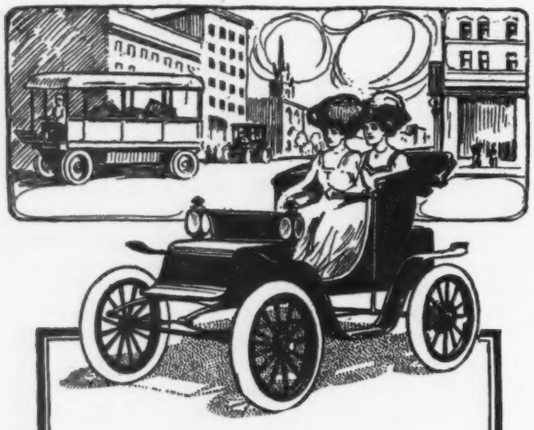
To give some idea of the loss in revenue occasioned by the use of the older meter on single-phase motors, the two-meter, three-phase combination for three-phase power measurement, or any induction load, consider the case of a 16-in. fan running on a 10-amp meter, taking about 1.25 amp at 110 volts, at 65 per cent power factor for 150 days of eight hours each, or 1000 hours. The actual consumption would be about 90 kw-hours, which at 8 cents would amount to $7.20. The meter would show a registration of only about 74 kw-hours, which would amount to $5.92, or a net loss to the company of $1.28 per fan. An arc lamp would even show a greater loss. An investigation of this nature made it evident that care should be exercised in placing only the newer type meters on fan service, the older ones being reserved for the incandescent lighting load.

A special test was also made on pivot-bearing jewels with the idea of replacing the present sapphire bearings with diamond jewels. Out of a lot of seven new sapphire jewels an average life of 900,000 revolutions was attained before any pitts or scratches appeared on the surface. With three diamonds, operating under the same conditions, an average life of 9,000,000 revolutions was attained. If the life of the jewel be based upon the record made by the diamond jewel and there be taken values the results of tests made upon 22 sapphire jewels removed from meters that had been in service for a greater or

less length of time, computing energy at 5 cents per kw-hour and diamond jewels at an extra cost of $1.40 each, the diamond would show a net advantage over the sapphire of from $26.80 for 700 meters operating at 5 per cent average load to $1 for the same meter at 40 per cent of full load. The author said that too much care cannot be taken in the selection of meters, in buying new ones and in properly selecting the older ones that may now be in possession of the company for service where they will give satisfactory results.

Electric Vehicles Advertised by a Central-Station Company.

The active interest that central stations are now taking in calling to the attention of the public the merits of the electric vehicle is shown by the advertisement of the Commonwealth Edison Company in a Chicago daily newspaper of Oct. 19. In several ways the demand for electricity for charging electric automobiles forms a desirable load on the central station, and it follows that far-seeing managers of electric service properties are desirous of encouraging the business. The principal demand for electricity used for this purpose comes during the summer months, when the lighting load drops off and when there is a somewhat decreased need for electricity for factory motors and heating appliances. The load factor of this business is also fairly good, and taken altogether the extension of the electric-vehicle business, relating both to pleasure and commercial vehicles, is worthy of attention.



The Efficiency of the "Electric"

is beyond question. For pleasure purposes it is ideal. It costs less than any other type of Automobile and its expense for upkeep is remarkably low. It is so simply operated—so easily controlled that a beginner can successfully run it. And considering safety, cleanliness and comfort—nothing compares with it for pleasure driving.

Its Wide Range of Usefulness

For trucking—or delivery—the Electric Vehicle is without a superior. In this field it represents maximum economy in barn space—low cost for maintenance and operating expense.

Charging Stations for Electric Vehicles are conveniently located all over the city. Arrangements may easily be made for wiring your stable or garage—for charging—by means of which you may operate your car at the utmost economy. For particulars call Randolph 1280.

Commonwealth Edison Company
139 Adams Street

ELECTRIC VEHICLE ADVERTISEMENT.

In the accompanying advertisement the Commonwealth Company calls attention first to the advantages of the electric car, both for pleasure purposes and for trucks or delivery wagons, and then points out how easy it is to arrange for charging the batteries in these automobiles either from public garages or from plants installed on the premises of the owners of the vehicles.

British Central-Station Rates.

The inaugural address of Mr. W. M. Mordey, president of the British Institution of Electrical Engineers during the past year, is now some months old, but far from being out of date in its matter. It is particularly rich in valuable data, and in effect is a spirited and effective defense of the British central-station industry against the popular imputation of lack of vigor. Mr. Mordey takes up the specific question as to whether electrical supply in England is backward and ineffective as compared with other countries, and brings to the support of the negative a formidable battalion of statistics. Of course, it must be admitted at the start that British electrical industry is somewhat handicapped by legislative restrictions of a character that make the initiation of large enterprises a matter of grave difficulty, and in particular make large power transmission work almost impossible. How far would Americans have advanced if every charter had to be fought through the United States Senate in its usual dilatory frame of mind? That British industry has made the progress that is evident from Mr. Mordey's presentation is a subject for profound congratulations. They are perhaps slow to move, but once under way they push doggedly ahead alike in industry and empire building and the results come in due season. The race is not always to the swift in the developing of industries, and in this case Mr. Mordey clearly shows that British persistence has in fact achieved considerably more than is popularly believed. Even a casual inquiry in England brings out the fact that electrical supply is quite widespread and relatively cheap, and the further one goes in the investigation the more striking the results.

Mr. Mordey marshals his data in a very telling manner. He gathers the complete data for six typical cities of three classes: First, those over 350,000 inhabitants; second, 100,000 to 200,000, and third, 10,000 to 20,000. Beside these stands London, unique, colossal, unapproachable. Now, taking up these groups, he finds for the large cities an average actual price of 6.44 cents per kw-hour, for the moderate sized cities 6.60 cents, and for the small cities 8 cents. These figures apply to lighting alone. It is evident at a glance that the average Briton gets electricity at a very moderate figure. London, even in spite of its heterogeneous supply, furnishes lighting at 6.55 cents per unit. The low prices set one to thinking, for their reason is not quite self-evident. That they are lower on the whole than here is clear, and Chicago, the only American city studied by Mr. Mordey, confirms this judgment by showing an average of 7.04 cents per unit. Now, in the first place there is an element of some uncertainty introduced by the fact that the supply in 16 of Mr. Mordey's 18 typical cities is from a municipal plant. And experience shows that in such plants there are very often unconsidered matters that result in a cost apparently lower than it really is and hence tempting to a lower price. This fact, whatever it may be worth, certainly has some bearing in comparison with American plants. In the case of German plants, which are largely municipal, this element of doubt may perhaps be set aside.

Another thing to be borne in mind is that in England competition with gas is a rather serious matter, gas being in general very cheap notwithstanding the high cost of coal. Here the gas man is on the defensive, there he is rampantly aggressive. Hence, there is a strong tendency toward forcing downward

the price of electricity. Finally, as compared with American the labor costs in England are low. In Germany, on the other hand, labor costs are not far from the same as in England. To continue his comparison, Mr. Mordey takes the corresponding groups of German cities, setting Berlin apart in a class by itself, and making his classification on the same basis as with English cities. For the large city the average price of energy for lighting turns out to be 11.34, for the medium-sized cities 9.34, and for the small cities 10.54 cents per kw-hour. More than this, every one of the six large German cities charged a price higher than the highest English city of the same class. Surely the British consumer is not getting the short end of the bargain when it comes to the cost of energy. And it is evident that the British consumer appreciates his advantages, since in the large cities he used for lighting 12.7 units per inhabitant, in the medium cities 9.2, and in the small cities 12.6. The corresponding German figures are 7.68, 7.30 and 12. London runs up to 28 units for lighting per inhabitant, while Berlin stands at 15.8. For comparison consider Chicago with 36.7 units. In units for motors, however, Berlin stands at 20.7 units per capita against London's 9.3, and Chicago comes cheerfully in with 24.3 units. Broadly speaking, all the figures show the stimulating effect of low prices on demand. It is a pity that Mr. Mordey could not obtain data from more American cities, but Chicago is an excellent type of the larger ones. His data for Paris were unfortunately incomplete, but showed a very much smaller use of energy than in London or Berlin, as might be expected from the enormous Parisian prices—higher probably than in any other city having any claim to consideration. It is interesting, by the way, to note that Chicago shows greater use of lighting energy per capita than any other city in Mr. Mordey's list and in total use per capita is excelled by but one, Geneva, with 60.6 units per capita for motors. All in all, Mr. Mordey has clearly shown that his countrymen have been holding up their end excellently so far as relates to the commercial side of electricity.

Electric Service at Saratoga, N. Y.

BY WILLIAM H. STUART.

Saratoga, N. Y., has a winter population of 13,000, and in the height of the summer season 50,000. The main source of wealth to the citizens are the summer visitors, and the principal industry is the manufacture of silk gloves. In 1887 the Saratoga Gas Company started an electric light plant, the first in the town, as a side issue. This plant was located on the gas company's property on Spring Avenue and was housed in one of the gas-works buildings. The equipment at that time consisted of a 50-light Fort Wayne and Jenny arc machine. This was driven by a 65-hp Armington & Sims engine. The boiler was rated at 50 hp. In 1889 the American Illuminating Company started a plant in opposition to the gas company, at the corner of Ash and South Franklin streets. The equipment of this plant consisted of a 100-hp boiler, one 50-hp and one 75-hp Armington & Sims engine and two American-Wood arc-light machines. In the next year a consolidation took place, the title of this combination being the Saratoga Gas & Electric Light Company. The plant of the American Illuminating Company was dismantled and the equipment was moved to the gas works on Spring Avenue. To this equipment was added a Westinghouse alternating-current incandescent machine. In this same year, 1890, another company known as the People's Gas & Electric Company was organized. This company's plant was erected at a place called Geysers, and its equipment comprised two 50-light Westinghouse arc dynamos and one 750-light incandescent machine. After operating nine months the company failed. In 1893 the Saratoga Gas & Electric Light Company was reorganized and took up the business of the defunct People's Gas & Electric Company. The name of the company was changed to the Saratoga Gas, Electric Light & Power Company, which name is still retained.

On July 3, 1903, the plant of the company was shut down and dismantled and energy purchased from the Hudson River Electric Company. The amount purchased at first was about 125 hp, but the load has steadily increased until to-day it is about 3500 hp. The energy is received at a tension of 23,000 volts and is transformed to 2300 volts and again stepped down to 127 volts, single-phase, for lighting circuits and 220 volts, three-phase, for motor circuits. The company simply owns the outlets from the Hudson River Electric Company's converter station at the Geysers, and thus has nothing to do with the generating or transforming apparatus. The main water-power station of the supply company is located at Spier Falls, this being supported by another water-power plant at Mechanicsville. Here also is a steam emergency plant which is kept in readiness for operation in case of trouble.

Street lighting is done under a four-year contract dating from October, 1908. The number of lamps in nightly operation is 159 enclosed-arc lamps and 167 20-cp series incandescent lamps. The former are furnished at a cost of $87.50 per lamp per year, the latter costing $20 per lamp per year.

The meter department of the company is located at the office, 491 Broadway. Each meter is tested when received from the maker and retains the maker's number, by which it is known upon the records of the company. The meters, both gas and electric, are looked after entirely by the meter men. There are four men who operate this department and their duties call for testing, repairing and reading the meters every month. They also deliver bills and attend to inside trouble.

In 1903 the company started a new-business campaign along organized lines. Two men were delegated to act as solicitors, spending all their time during the spring and summer months securing new business and in the fall and winter months devoting their time to other work. A card system was introduced which noted every house in the town and its lighting equipment. These cards are kept up and used over and over again. Each call of the solicitor is noted under the proper date. From time to time special campaigns have been made to introduce the flatiron and other heating and cooking appliances and also the electric fan. The increase from 100 hp to 3500 hp is traced directly to three things: soliciting, introduction of a 24-hour service, and a reduction in rates from 20 cents to 4½ cents per kw-hour to large consumers. All of these improvements were started in 1903. In 1905 and 1906 the company did considerable advertising, but in 1907 and 1908 the advertising was suspended on account of the financial depression. Advertisements are carried in the two daily papers, the reading matter being changed once every week. Occasionally the company places pasters on the monthly bills advertising some feature like the flatiron or the electric fan. Manufacturers' advertising matter of electric appliances is always sent out with the bills and placed for distribution in the office.

Size of motor in horse-power.	Minimum charge.	Approximate full load consumption monthly in kw-hours; 10 hours per day, 26 days per month.	Average price per kw-hour when motor is run at full load.	Constant price per kw-hour after minimum charge has been deducted from gross charge.	Price per horse-power per month when motor is run at full load.
1	$1.00	200	$0.05	$0.045	$10.00
2	2.00	400	.04	.035	8.00
3	3.00	600	.04	.035	8.00
5	5.00	1,000	.035	.030	7.00
7.5	7.50	1,500	.035	.030	7.00
10	10.00	2,000	.03	.025	6.00
15	15.00	3,000	.0275	.0225	5.50
20	20.00	4,000	.025	.02	5.00
30	30.00	6,000	.025	.02	5.00
40	40.00	8,000	.0225	.0175	4.50
50	50.00	10,000	.02	.0150	4.00

The rate for incandescent lighting varies from 11 cents to 5 cents per kw-hour. The minimum charge is $1.10 for 10 kw-hours or less consumed in any one month. A discount of 10 per cent is allowed for prompt payment. The sign rate is 5 cents per kw-hour. Panel signs are furnished free of charge and maintained. The minimum charge upon this class of signs is $1.90 per month on one of 24 4-cp lamps. All special signs

are sold at cost to the consumer and erected free. The signs are maintained for the consumers free of charge.

The rates for motor circuits are given in the table on the preceding page.

Thus, according to this scale, in computing the bill of a consumer who has a 10-hp motor with a consumption of 100 kw-hours, the charge would be $12.50. This would be 100 kw-hours at $0.025 plus a minimum charge of $10, making the total bill $12.50. It is readily seen that the rate is a favorable one for the consumers. There are no special rates granted. The company adheres strictly to its schedules.

During the last few years the company extended its service to Balston Springs. Here the consumers were all on the flat rate per equipment and without regard to the installation. After awhile it was thought advisable to install meters in this territory. That this could not be done without loss of some of the consumers and considerable dissatisfaction was apparent. It was found that consumers were getting energy for almost nothing. One of the largest consumers in Balston was approached first and a meter placed on his service. It was found that he was getting energy on the old flat rate for about $125 per month cheaper than by meter. On investigation it was found that there were many lamps that were never turned off. In the coal bins and storeroom, out-houses and halls large lamps were used where smaller ones would have answered. When the matter was called to the attention of the consumer, he readily made a change in the equipments with the result that light sufficient for all needs is obtained at a cost a little above what was paid on the flat rate. One large consumer would not listen to the meter proposition and installed an acetylene plant. This he operated but three months when he again used the company's service.

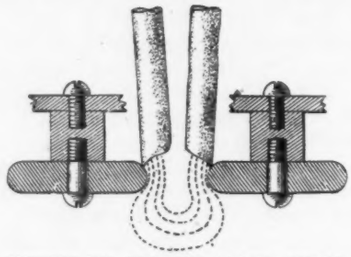
When a consumer has used a motor for a time and finds that he needs a larger machine, the company makes arrangements whereby the old motors will be sold by it to a firm which will give a much better price for the old machines than the consumer could possibly obtain were he to try to sell the motors himself. This policy has been the cause of consumers making the necessary changes in their equipment just as soon as they felt the need of additional power.

Mr. P. F. Roohan, the general manager, speaks of the work of the company in Saratoga as one that had been growing fast for some time and will still continue. Saratoga is wholly a high-class summer resort, and, of course, the heaviest business is done at that season. The balance of the year the business drops off considerably. The work of securing all the business possible must be done really during a few months of the year and it requires the energy of the entire force. The advertising is directed to uncover the business, but the company acquires it by hard and quick soliciting. The motor load is increasing and while the town is in no way a business one, yet there is considerable manufacturing done, and there is bound to be more. The company is seeking to secure all the business. Within a short time it will again resume an active campaign for new business, which was discontinued on account of the recent financial depression. The officials of the company are: President, Mr. E. Ashley; vice-president, Mr. C. E. Parsons; secretary and treasurer, Mr. E. West; manager and superintendent, Mr. P. F. Roohan.

INTERIOR WIRING AND ILLUMINATION

Support for Flaming-Arc Electrode.

The material forming the stops for the arc-lamp electrodes shown herewith is the subject of a patent issued on July 27 to Mr. Ralph Scott. Use is made of an alloy having equal parts of zinc and aluminum. The oxides of these metals are non-conducting, so that the stops will not allow an arc to form on their surfaces. The stops are non-magnetic and do not attract the arc, and they are heat-conductive and hence remain comparatively cool even where exposed to the arc zone. It is

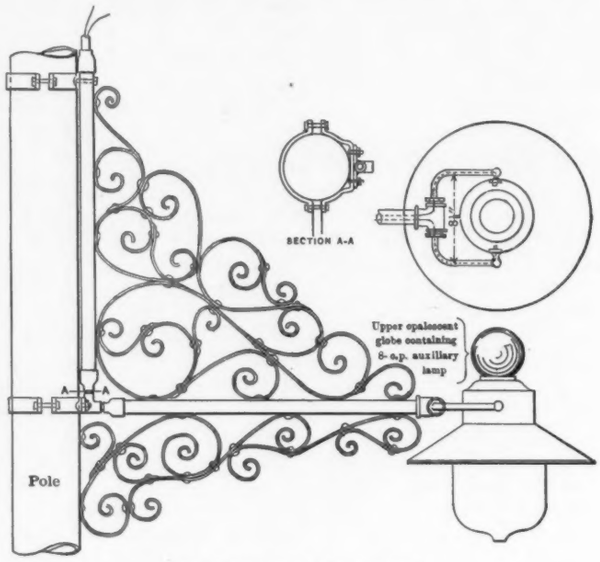


SUPPORT FOR FLAMING-ARC ELECTRODE.

claimed that the fusing point of the zinc-aluminum alloy is so high that it is out of the range of possible fusion by the arc.

Utilizing Electric-Railway Poles for Lighting in Kansas City.

Visitors to Kansas City are impressed with the clever and artistic way in which the side-suspension poles of the street-railway company are utilized also for street lighting. The accompanying drawing shows how the poles of the Metropolitan Street Railway Company have been made to serve this purpose by the engineers of the Kansas City Electric Light Company. It may be explained that both the street-railway and electric



DIAGRAMS OF LAMP BRACKET.

light companies are owned by the Kansas City Railway & Light Company.

A handsome bracket fixture is attached to the electric railway pole at the side of the street. The framework of this fixture is of ornamental iron work, and the dimensions are such that the lamps, suspended by a trunnion, extend 40 in. over the street. The fixture is clamped to the iron pole in the manner clearly indicated in the accompanying drawing. While the fixture itself is made of iron work, the hood of the lamp is of copper. As originally designed, it was intended to place one 250-watt tungsten lamp, enclosed in a clear globe, in this fixture, but it was found, owing to the vibration and the delicate filament, that the life of the lamp was very short and also that the lamp threw a shadow on the street which was undesirable.

To overcome these defects the single 250-watt lamp was replaced with three 100-watt tungsten lamps. This ar-

rangement has been found to be very efficient from an illuminating point of view, while the life of the lamps has been increased materially, as the filament in the 100-watt lamp is much shorter than in the 250-watt size and is therefore better able to withstand vibration.

Above the lamp hood is a small opalescent globe about 5 in. in diameter. In this globe is placed an ordinary 8-cp carbon lamp. This finishing touch is considered essential, as it not only rounds out the fixture and makes it much more artistic and satisfactory, but it also prevents the formation of any deep shadow above the principal light-giving source. The whole combination is pleasing in appearance, and the fixtures are not only useful at night, but attractive in the daytime as well. The addition of the little lamp above the hood of the main lamps used for lighting is something of a novelty, but the result shows that the idea is conducive of an illuminating advantage that is generally commended.

Industrial Show at Buffalo.

The chief feature of the Buffalo Industrial Show, which was held from Oct. 6 to 16, was the electrical display, both inside the large arsenal and on the streets. The outside illumination consisted mainly of two large arches, one at Lafayette Square and Main Street, which is shown in the accompanying photograph, and the other at the entrance to the Broadway Arsenal, where the exposition was held. This second one spanned the street, Broadway, and was as high as the building. Besides these, decorative lamps spanned Broadway at intervals and showed the way from Main Street to the exposition building. The International Railway Company decorated and illuminated with about 250 lamps a large flat car on which stood a huge white buffalo, about 15 ft. high, with two incandescent lamps for eyes. This float was run over the principal car lines of the city between 5 and 9 o'clock each day.

The general interior illumination was furnished by 5000 16-cp carbon-filament lamps placed in 10 girder arches and five large electroliers. The roof truss work was concealed by fireproofed yellow bunting. For special lighting of booths tungstens, linolites, carbon-filament and Cooper Hewitt lamps were used. Although the building is very large (60,000 sq. ft.), no arc lamps of any kind were used anywhere.

In an industrial show there are always a large number of mechanical devices and machines that require power for demonstration, as does also the exhibitor who manufactures some of his products to show the different operations. There were 18 motors equivalent to 90 hp connected to furnish power.

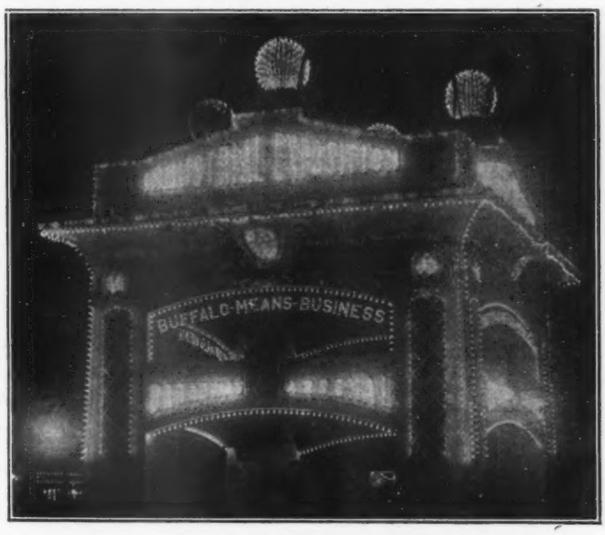
For all lighting circuits, 25-cycle, single-phase current was used, distributed by three-wire system at 205 volts. In a small adjoining portion of the arsenal were placed the main transformers, four of 25 kw and three of 50 kw rating, connected to the 2200-volt outside overhead system. The distributing circuits were run from a large switchboard placed inside the main building.

For the five booths of the Buffalo General Electric Company two transformers were mounted on the exterior west wall of the arsenal. In a transformer house in the exhibit of the Cataract Power & Conduit Company there were three 20-kw oil-cooled transformers connected in delta, reducing the e.m.f. to 440 volts from 2200. One 5-kw transformer, connected to one phase, reduced the e.m.f. to 104 volts for the lighting circuit. This working example of transformer-house equipment was completed by an oil switch and circuit-breaker panel.

The exposition had an auspicious opening, the Japanese Commercial Commissioners being the honored guests on the opening night, Wednesday, Oct. 6. Baron Shibusawa threw in the main switch and formally opened the show.

The exhibit of the Buffalo General Electric Company covered five sections of floor space, and apparently was the most interesting to the majority of people. The "House Electric," as the exhibit was called, contained four rooms completely furnished in all respects, the kitchen, dining-room, bedroom and drawing-room. The fifth section contained a line of the General Electric Company's latest electric household devices and utensils. The wiring was very good, separate circuits taking care of the heating devices and the lamps, and a large number of base plugs were installed in each of the five booths so that demonstrations of all apparatus by well-informed demonstrators were possible.

In the drawing-room, besides an artistic ceiling fixture and portable table lamp, there was an electric luminous radiator kept in operation; in the dining-room, ceiling and wall fixtures and coffee percolator, chafing dish, toaster and tea kettle ready for use on the table. The bedroom was comfortably lighted and was provided with several base plugs also. This room was fitted up with a luminous radiator, water heater, curling iron, shaving mug and vacuum cleaner. Last, but probably most popular, was the kitchen, where were displayed a cooking table, oven, frying pan, tea kettle, coffee pot, griddle, double boiler and numerous other devices manufactured by the General Electric Company and the Westinghouse Electric & Manufacturing Company. A Thor electric washing machine proved very interesting to the women, as, in fact, did all of the household devices. The lamps used in these booths were 25-watt tungstens.



DECORATIVE LIGHTING OF ARSENAL FOR INDUSTRIAL EXPOSITION.

The Cataract Power & Conduit Company's exhibit attracted unusual attention considering that the nature of the work or exhibit of a transmission company is more technical and is more difficult to show than is electric lighting and heatng apparatus. The transformer house, which was part of the exhibit, has already been described. A 40-kw, 250-volt, direct-current generator driven by a 60-hp, 440-volt, three-phase induction motor, with switchboard, was also shown, and four aluminum 25,000-volt lightning arresters with horn-gaps were connected up, while a fifth was shown in sections.

The Robertson-Cataract Electric Construction Company exhibited, among other electrical devices, fuse cabinets, panels and an induction motor dis-assembled. Two Cooper Hewitt lamps were used to augment the general illumination. The Buffalo Forge Company showed some electric forges and blowers; Schneible Brewery Machine Company, motor-driven beer pumps, etc.; United States Headlight Company, different types of headlamps as used on electric and steam railways all over the country; Wegner Machine Company, motor-driven refrigerating plant in operation; and the Automatic Transportation Company, motor-driven carriers. Both the Bell and Federal Telephone companies had booths.

The exposition in all respects was better and more popular than previous ones and will continue to be an annual affair. That the electrical illumination and decoration was largely responsible for its success is certain from the main remarks which were heard—it was really an electrical show.

An Automatic Starting Compensator.

By George S. Wall.

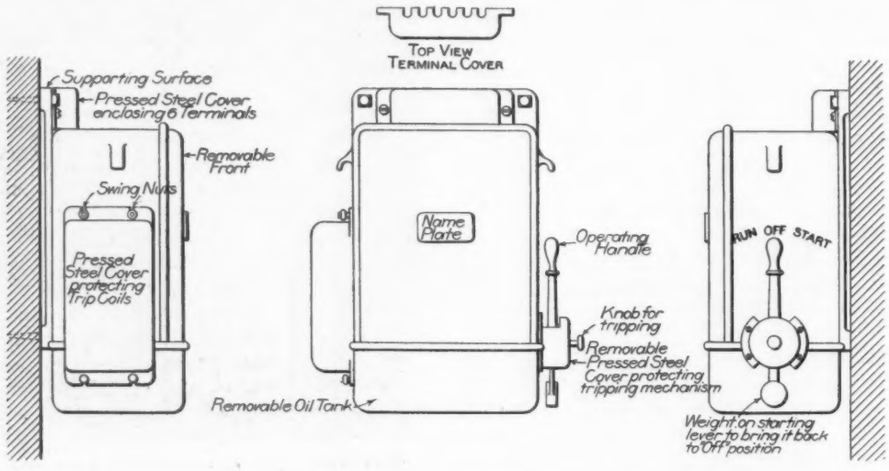
The subject of safety service boxes for induction motors must have been frequently considered by industrial plant engineers. A recent writer proposes enclosing the fuses protecting induction motors in a service box which should also be arranged so that it can be made to perform the functions of a switch. This appears to be excellent as far as it goes, but there is a well-defined movement on foot toward the elimination of fuses for the protection of motors and the substitution therefor of automatic cut-outs. The first cost of automatic protecting equipment is very much higher than that of fuses and holders, but for many applications the annual cost, taking into consideration the value of fuse renewals and of time and labor lost while a blown fuse is being replaced, is less with automatic protection. Certain industrial corporations specify double-pole circuit-breakers on all direct-current motor-starting panels, and much of the motor-starting equipment for the United States Navy is provided with this kind of protection. The same manufacturing concerns referred to above protect polyphase motors with circuit-breakers having the breakers so arranged that protection against overload is provided with the starting compensator switch in either the running or the starting position. A no-voltage release device for the circuit-breaker is usually specified. These equipments serve their uses well, but usually bare metal current-carrying parts are exposed, which is undesirable for electrical, commercial and humanitarian reasons. Furthermore, it does not seem reasonable to cut a circuit-breaker into a circuit which already contains an oil switch which can readily be made automatic.

The writer has often wondered why some one of the induction-motor manufacturers did not develop, for use with polyphase motors, what might be termed an "automatic starting compensator." This would be a standard compensator with which would be incorporated overload and no-voltage trip coils so arranged as to cause the oil switch, which now forms a part of each compensator (probably somewhat modified) to assume an open position under overload or no-voltage conditions. Such a device might be arranged somewhat as indicated in Figs. 1, 2 and 3, which show, respectively, left side, front and right side views of a commercial starting compensator arranged for automatic protection.

On the left-hand side of the cast-iron case, enclosing the compensator coils, is mounted a pressed-steel cover, easily removable by unscrewing swing nuts, containing the no-voltage and overload release trip coils. Motion from these is transmitted to the tripping mechanism, concealed in a cover at the right-hand side of the case, by means of a slender rod extending through the switch shaft, which is hollow. A knob extends to the right from the tripping-mechanism case for manually tripping the switch.

The switch operates in oil contained in the removable oil tank and is restrained by a spring which tends to hold it always in an open position. The operating handle lever is not rigidly attached to the hollow switch shaft and only operates the shaft when the tripping mechanism is in normal engagement. Upon either no-voltage or overload, one of the trip coils, located within the pressed-steel cover at the left of the case, acts and disengages the handle lever from the switch shaft and by virtue of the spring referred to above, the switch assumes an open position.

The following six requirements should be satisfied in the construction of an automatic starting compensator designed to fulfill the requirements and withstand the abuse of industrial-plant operation at the hands of ignorant and often vicious operators: (1) All bare current-carrying parts should be totally enclosed, as should trip coils and tripping mechanism. Swing nuts should be provided for attachment of covers which it is necessary to remove at times of inspection. (2) Handle and switch should be so restrained that they must first be thrown to "starting" position before being thrown to "running" position. (3) Handle and switch should be so arranged that they cannot remain in "starting" position unless manually held there. If the hand is removed from the handle they should return automatically to "off" position. (4) Handle should be so arranged that a quick throw is required to bring it and switch from "starting" to "running" position. (5) When brought into "running" position handle and switch shall be automatically held there until released, by either the no-voltage or overload release or the hand tripping knob, when they shall automatically return to "off" position. (6) A no-voltage and an overload release shall be provided which will, on no-voltage or overload: (a) permit switch and handle to return automatically to "off" position from the normal "running" position described under 5, or (b) permit switch to return automatically to "off" position even though the handle be manually held in either "starting," "running" or intermediate positions. When the hand is removed from the handle it also should automatically return to "off" position.



FIGS. 1, 2 AND 3.—DIAGRAMMATIC VIEWS OF AUTOMATIC STARTING COMPENSATOR.

The necessity of the requirements outlined under item 1 is obvious. It is really deplorable to observe the makeshiftts which electrical superintendents in some mills have to resort to in order to enclose "live" parts of controlling apparatus located in exposed positions. Enclosures of simple, rugged design should be provided by the manufacturers of equipment. Swing nuts should be used where possible instead of ordinary machine screws because they are not easily lost.

Referring to item 2: If a compensator is not arranged as therein specified the unskilled attendant is as likely to throw

the starting handle to the "running" position first as to the "starting" position. Most commercial starting compensators are now so designed that this regulation is complied with. If the suggestion of item 3 is not followed, frequently motors will be allowed to operate for long periods on the "starting" voltage, and as in such cases they are usually over-protected, trouble ensues from overheated stator windings. Some modern compensator starters are arranged in accordance with this requirement and some are not.

The provision of item 4 is necessary to prevent the appreciable slowing down of the connected motor while the compensator switch is being thrown from "starting" to "running" positions. Some commercial starters already have this feature and some have not. Features to meet the requirements of items 5 and 6 are not, to the writer's knowledge, incorporated with the starting compensators furnished by any induction-motor manufacturer, and it is by their incorporation that the use of fuses at the compensator could be eliminated.

The wiring diagram in Fig. 4 is a suggestion for a scheme of connections for an automatic starting compensator, such as this article advocates. At the point where the branch wires to the starter are tapped from the mains, fuses are provided. These are for the protection of the branch conductors only and are not for the protection of the motor. They should be of large current-carrying capacity so as readily to pass the starting current to the motor. A no-voltage trip coil is bridged, between two of the conductors, within the starter. Overload trip coils are inserted in series with two of the lines. The taps from these to carry the starting current are taken from such a turn in the windings as to cause the coils to trip on excessive starting current. The running current, which is always considerably less than the starting current, traverses the entire length of the trip-coil winding to provide sufficient amp-turns to give an equivalent tripping effect.

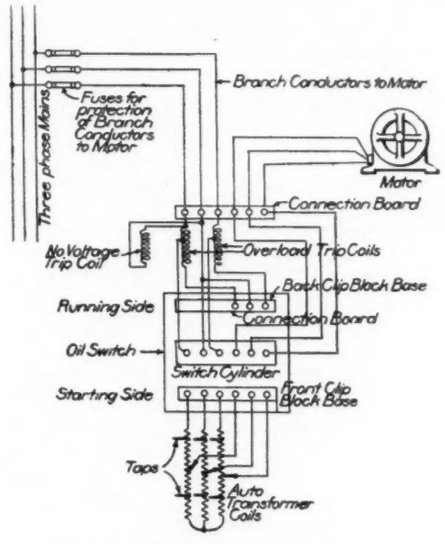


FIG. 4.—WIRING DIAGRAM.

It is further suggested that it is more logical to cast the legends "Run," "Start" and "Off" on the upper portion of the compensator case, as indicated in Fig. 3, where they are conspicuous and easily read instead of in the usual obscure location at the bottom of the starter on the side of the oil-tank casing. With the legends located as in present practice, on the oil-tank casting, when the tank is removed, to admit of inspection of the switch, there is nothing to indicate to a "green" electrician which is "starting" or which the "running" position, and in these days, when every second has its value, it should not be necessary to refer to a casting, which may have been carried away for new oil or for cleaning to get the information.

LETTER TO THE EDITOR.

Exhaust Steam Heating.

To the Editor of Electrical World:

SIR:—The several articles on steam heating by central stations which appeared in your first issue for October bring to mind the statement frequently heard that less coal is required when the exhaust steam is used for heating than when it is allowed to go to waste. Among the conditions that have caused this statement to be put forward in good faith, mention should be made of the increase of the electric lighting load when exhaust steam heating is undertaken. It is well known that the amount of coal required per kw-hour decreases considerably when the output from the station apparatus increases, all other conditions remaining unchanged. When exhaust steam heating is added to the load on the boilers, it is usually the case that the electrical load has increased also, so that the coal which would be required per kw-hour under the larger electrical load, without steam heating, would be considerably less than was actually needed before the heating load was added. Hence, when one compares the total coal used per kw-hour at the larger load directly with that required for the smaller load, he ignores an important change in the conditions. It is not surprising, therefore, to learn that in many cases the small increase in coal required for the heating load when divided by the increase in kw-hours of the electric load is even less than the coal per kw-hour required for the smaller initial electrical load.

The report in the issue referred to, from the Johnstown, Pa., plant, shows an increase in electrical output of 11 per cent when the exhaust steam heating load was added, and doubtless this increase would account in part for a decrease in the coal required per kw-hour. The reported decrease in actual coal consumed of 11 per cent is to be attributed to many causes in addition to the use of the exhaust steam, such as improved methods of firing, better grade of coal, less loss by radiation, etc. Whatever may be the causes for the results, the fact remains that the increase in coal required when the exhaust steam is used for heating is so small that the practical operating man is unable to detect it in many cases. It would seem that the advantages to be derived by central stations from adding an exhaust steam heating load would justify a thorough investigation by every manager in the Northern States.

NEW YORK. A. M. STRATTON.

DIGEST OF CURRENT ELECTRICAL LITERATURE

Abstracts of the important articles appearing in the electrical periodical press of the world

Generators, Motors and Transformers.

Commutation.—J. SUMEC.—The conclusion of his theoretical paper on the present status of the commutation theory. The author discusses the current density when the brush leaves a segment and then applies his theory to the calculation of commutating poles.—*Elek. Zeit.*, Oct. 14.

Regulation of Low-Voltage Transformers.—E. F. GEHRKENS.—An illustrated description of a new method of voltage control for a 1600-kw, 25-cycle, single-phase transformer. It is wound for 2200 volts primary and from 40 volts to 200 volts secondary, the range being obtained by means of taps in the primary and a series or parallel connection of the secondary. It is designed to deliver 1600 kw at any voltage within the range given—that is, it has a range in current of from 8000 amp at 200 volts

to 40,000 amp at 40 volts. The regulation is made gradually and not in steps by means of a combination of switches so arranged that, by the use of a compensator and a number of small resistances, a simple and smooth regulation is obtained. Detailed drawings are given of the arrangement.—*Gen. Elec. Review,* October.

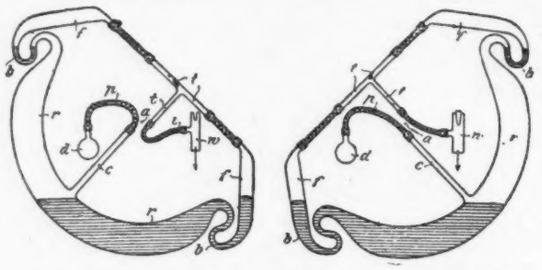
Lamps and Lighting.

Metallic-Filament Lamps for Street Lighting in England.—An article on the progress made during the last 12 months in a large number of English cities in the use of metallic-filament lamps for street lighting. The chief advance has been made in side streets. The use of flame-arc lamps in such positions is rather uneconomical, while the use of either Nernst or ordinary carbon lamps in fairly large units is inefficient from the electrical point of view. The metallic-filament lamp has just filled the breach, for it is now possible to obtain a high-efficiency lighting unit giving sufficient illumination for the purpose at a low cost. At Marylebone 1964 street lamps have now been converted from gas to electricity, costing nearly $7,500 less than was paid for the gas; nevertheless, a profit is being made on the electric lighting by the municipal station. At Croyden 265 side-street lamps have been installed. The lamp contains a single 200-volt, 88-watt Osram unit, giving approximately 70 cp. Further, it is proposed to scrap all the enclosed arc lamps (direct and alternating) and to replace them by high-candle-power metallic-filament lamps. Although it is not definitely decided whether a specially designed lantern containing three 110-watt, 200-volt lamps shall be used, a number of these are being erected and are giving very satisfactory results. Although the specific lighting output in candles per watt is not so high as with the magazine flame lamp, the initial cost is about one-sixth of that of the arc lamp, and beyond the cost of lamp renewals and energy there is very little further expenditure. A life of 2000 hours can be safely reckoned on for both the 88-watt and 110-watt lamps. At Croyden almost the whole of arc lighting will be replaced by high-candle-power metallic-filament lamps with the possible exception of the main street. Similar notes are given about 17 other English cities.—Lond. *Electrician,* Oct. 15.

Metallic-Filament Lamps.—An illustrated review of the metallic-filament lamps made at present commercially by British companies. Compared with last year great progress has been made, especially since the high-voltage lamp has materialized and metallic-filament lamps can now be used in all positions. One of the companies gives specific consumption of the low-voltage tungsten lamps at 1.1 watts per hefner candle-power and that of the high-voltage lamps at 1.2 watts. The lowest possible candle-power obtainable at present with metallic-filament lamps is a 5-cp tungsten lamp for 25 volts. The great suitability of prismatic glass globes, etc., for metallic-filament lamps is emphasized.—Lond. *Electrician,* Oct. 15.

Titanium Arc.—Wm. S. Weedon.—The titanium arc is formed between a titanium carbide cathode and a copper anode, the latter being above the former. The titanium arc is a flame arc and the efficiency increases with increase in current density and with increase in arc length. At 3 amp, 103 volts, and 1-in. arc length, the specific consumption is 0.228 watt per horizontal candle-power. At 2.87 amp and 95 volts the consumption is 0.51 watt per mean spherical candle-power and 0.37 watt per mean hemispherical candle-power. Titanium carbide arcs are most satisfactorily operated on a constant-current circuit rather than on a low-voltage multiple circuit. Some notes are given on the preparation of titanium carbide electrodes and on the use of titanium suboxide instead of the carbide. The suboxide gives even a somewhat better efficiency than does the carbide. —*Gen. Elec. Review,* November.

Mercury Air-Pump.—An illustrated description of a new mercury air-pump which is mechanically driven and which enables an extremely high vacuum to be attained. It consists essentially of a bent tube *r,* half-filled with mercury (Figs. 1 and 2) ending in two S-shaped extensions *b,* and connected at its center point by the straight tube *c,* and a flexible tube *p,* to the vessel to be exhausted *d.* The S-shaped ends expand into the tubes *l* to an ordinary air-pump *w.* In order to save time, the pressure in *d* is first reduced to from 10 mm to 20 mm of mercury by means of a pump *w* setting the tube in the position shown in Fig. 1. The apparatus is then set rocking about the axis *a,* from the position of Fig. 1 to that of Fig. 2. The mercury retained in the S-shaped extensions acts as a valve, preventing the return of air from the tubes *f* into the main tube *r,* while at the same time the air drawn from the vessel *d* through *c* is forced through the S-tubes into the tubes *f* and is removed



FIGS. 1 AND 2.—DIAGRAMS OF MERCURY AIR-PUMP.

from these by the air-pump *w.* The pump is driven by means of a small turbine. It is stated that a vacuum of 0.00001 mm of mercury can be obtained with the pump. The parts can be very easily taken apart and cleaned. The pressure is measured by means of a special kind of Macleod gage, arranged in the form of a spiral tube, in which a portion of the exhausted space can be cut off by a mercury seal and the gases compressed to 1/1000 of their original volume, with a corresponding increase in the pressure, which is thus rendered measurable.—Lond. *Elec. Review,* Oct. 8.

Daylight Efficiency of Artificial Illuminants.—H. E. Ives.—An illustrated discussion of two methods for obtaining a measure of the approach of colored light to daylight. The "white light efficiency" is obtained by considering the white light available by the use of absorbing screens. It is the ratio of the intensity of non-selective white light available to the intensity of the source. The "white sensation efficiency" is obtained by considering the amount of white which, with a spectrum color, would match the light. It is the ratio of intensity of white sensation to intensity of source. The latter method is preferable from a scientific standpoint, while the first method gives important information on the practical merits of a source for illuminating colored objects. The author shows how by graphical means it is possible to combine the results of both methods.—*The Illumin. Eng.,* October.

Portable Photometer.—G. C. Shaad.—An illustrated description of a portable photometer for measuring the intensity of street-lighting sources. The construction is simple, if a standard photometer screen of the Bunsen or Lummer-Brodhun type is available.—*The Illumin. Eng.,* October.

Electric Lighting.—L. Gaster.—The first of a series of illustrated Cantor lectures on modern methods of artificial illumination. The author gives a review of the various new incandescent lamps developed in recent years.—Lond. *Electrician,* Oct. 15.

Generation, Transmission and Distribution.

Electromagnetic Clutch.—An illustrated description of a clutch (Fig. 3) which consists of a stationary magnetic body containing a coil, and provided with feet for fixing to a suitable support. The armature is divided into two parts; the driver is fitted with a renewable cone of phosphor bronze or hard fiber (according to the nature of the drive) and the driven part is supplied to the energizing coil, which draws the two parts of the armature together, driving being effected partly by the friction of the cones and partly by magnetism. Between all other faces of the clutch an air-gap is maintained so that sticking from residual magnetism is impossible. The principal advantage of the clutch is that it has no slip-rings or brushes, the cable being connected to terminals fixed on the side of the stationary magnetic body. Some large clutches have been suc-

cessfully applied to rolling mills using 1200 hp at 350 r.p.m., and 800 hp at 215 r.p.m., and they have been running for some time on wire-rod mills, enabling the mill to be stopped instantly from any number of desired points, and providing an auto-

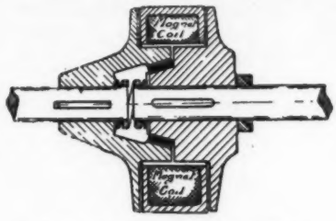


FIG. 3.—SECTION OF CLUTCH.

matic safety device against overload. Reversing clutches have been fitted to large planing machines, doing away with shifting belts, striking gear, etc.; they are said to be better than reversing motors, because the same speed of cut and return can be maintained for any length of stroke.—Lond. *Elec. Review,* Oct. 8.

Water-Powers in Europe.—T. KOEHN.—The conclusion of his long illustrated article on some important European water-powers and their commercial importance. In the present instalment the author deals with some water-powers in Bavaria, Italy, France and Norway.—*Elec. Zeit.,* Oct. 14.

Steam Pipes.—W. L. CATHCART.—An article on the loss of heat from uncovered steam pipes. The author discusses coefficients of heat conduction, the steam pipe as a cooling body, Dulong and Petit's and Peclet's experiments and formulas, test apparatus for saturated steam, heat losses of bare pipes conveying saturated steam, and the correction which must be applied to the computation of the latter losses from Peclet's formulas.—*Cassier's Mag.,* November.

Flour Mills.—J. LISTON AND L. O. GORDON.—An illustrated article on applications of the electric drive in grain elevators and flour mills.—*Gen. Elec. Review,* November.

Traction.

Single-Phase Traction in Hamburg.—W. WECHMANN.—The first part of a detailed illustrated description of the single-phase system used on the Blankenese-Ohlsdorf Road of the Prussian Railways. This is the first large single-phase road in the Prussian State railway system. The road is operated at 25 cycles and with 6000 volts on the trolley wire. The trains are built up of a number of train units, each train unit consisting of two motor cars coupled together. Motor cars have been supplied both by the Allgem. Elek. Ges. and by the Siemens-Schuckert Company. Each of the motor cars of the A. E. G. has two trucks, one having two motors and the other one motor (Winter-Eichberg type). Each motor is able to produce 115 hp for one hour at a speed of 27 km per hour. The weight of this train unit (double car) without passengers is 71,000 kg. Since there are 128 seats, the weight per seat is 570 kg. The weight per square meter is 975 kg. The weight of the electric equipment alone is 17 tons. Each of the Siemens-Schuckert cars has only two motors (series motors), each rated at 175 hp. The weight without passengers is 69,000 kg, or 566 kg per passenger and 948 kg per square meter of area. The electric equipment alone weighs 15.5 tons.—*Elek. Zeit.,* Oct. 14.

London Tramways.—J. H. RIDER.—His long reply to the extended discussion of his recent paper on the electric system of the London County Council tramways.—Lond. *Electrician,* Oct. 15.

Installations, Systems and Appliances.

Small Central Station.—C. D. HASKINS.—An estimate on the equipment of a central station for a town of 1200 inhabitants, with notes on the management of the commercial lighting and the street-lighting systems.—*Gen. Elec. Review,* November.

Heating of Water by Electricity.—The thermal-storage type of electric water heater described in the Digest in the issue of Sept. 30, when consuming 200 watts heats 25 gal. of water per day instead of 25 qt. as stated in the issue just mentioned.

Wires, Wiring and Conduits.

Electrolytic Time-Limit Relay.—An illustrated description of a new time-limit relay devised by W. B. Thorpe, which in its construction has some points in common with his electrolytic watt-hour meter (see description below). The construction is shown in Fig. 4. On the occurrence of an overload, the series coil *W* closes the cell circuit at *Y*. Directly electrolysis commences the float *O* is lifted so that a circuit is completed. If the overload continues, electrolysis continues until the float *U* comes in contact with the adjustable contact *T*. This contact comples the circuit of the tripping coil *X* through *Z*, and the main switch is opened. The time which elapses before this occurs is determined by the position of *T*, and is denoted on the scale in seconds, so that the relay can readily be set to any desired value of the time. Should the overload cease before the predetermined time has elapsed, however, the cell circuit is opened at *Y*, but remains closed through the contact at *P*, so that the electrolysis continues until the float *U* touches *T* as before. In both cases the evolved gases are fired almost immediately after this by the breaking of the circuit at the level of the electrolyte, as in the case of the meter, but in the latter case contact between *U* and *T* does not complete the tripping-

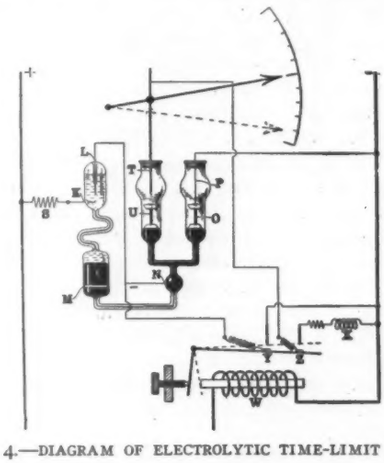


FIG. 4.—DIAGRAM OF ELECTROLYTIC TIME-LIMIT RELAY.

coil circuit, as it is broken at *Z* owing to the overload magnet having weakened. After even a momentary overload, however, the complete cycle of electrolysis and recombination takes place, so that a definite and constant time element is ensured. Although the right-hand bulbs of the cell are open to the atmosphere, the platinum mercury joint at *M* prevents the escape of the gases or electrolyte, and the cell therefore never requires refilling. This relay can be applied by substituting a shunt tripping coil for the usual series coil.—Lond. *Elec. Eng'ing,* Oct. 14.

Electrophysics and Magnetism.

Diffraction of Electrical Waves.—H. M. MACDONALD.—An abstract of a British Association paper. Imagining a source of Hertzian waves outside a sphere which might be transparent or opaque to the waves, the author calculates diffraction phenomena due to indirect and reflected waves at various distances from the sphere for different wave-lengths. For wave-lengths ⅛ mile the amplitude of the oscillations is reduced from unit value to 0.46, 0.43 and 0.40 at distances of 70, 93 and 116 miles; for greater wave-lengths the diminution is smaller.—Lond. *Engineering,* Sept. 24.

Magneto-Striction.—H. G. DORSEY.—An abstract of a Brit. Association paper on experiments on magneto-striction made with eight steels. The carbon percentages of the specimens ranged from 0.058 to 1.37, the phosphorus from a trace to 0.073, the silicon from 0.008 to 0.09, the manganese from 0.07 to 0.17, and the sulphur from 0.012 to 0.014. The rod under test was soldered on to a brass bar, while the free end bore with a needle system against a magnifier comprising a mirror; the usual magnification was 3000, but the apparatus admitted of going very much higher. The rod was placed within the magnetizing coil, which gave a very uniform magnetization over a

large portion of the rod. Instead of attempting to keep the temperature constant, which would have been difficult with his strong currents, he had heated the frame by a branch current to the temperature of the rod. The results of the many experiments are interesting, though the changes in length are far too small to become of practical importance. The maximum elongation is a function of the carbon contents, and there is a relation between the maximum elongation and the maximum susceptibility. The correction to be applied for the changes in length is of the same nature as the correction for the demagnetization of the ends of the rods. In strong fields the changes in length are dependent more upon the intensity of magnetization than upon the field.—Lond. *Engineering*, Sept. 24.

Electrochemistry and Batteries.

Concentration Cells.—F. J. Mellencamp.—An account of an experimental investigation in which simple concentration cells, made up of various solutions for which the heats of dilution have been determined, were investigated with reference to the application of the Gibbs-Helmholtz equation. The total heat of reaction becomes the heat of dilution and answers for the first term of the equation. The four following cells were investigated: (1) Zinc amalgam electrodes with zinc sulphate of different concentration as electrolytes. (2) Cadmium amalgam electrodes with cadmium sulphate of different concentration. (3) Zinc amalgam electrodes with zinc chloride of different concentration. (4) Lead amalgam electrodes with lead nitrate of different concentration. The first cell has a large positive temperature coefficient with a relatively small heat of dilution; the second, a small temperature coefficient with a relatively large heat of dilution; the third, a negative temperature coefficient with a large positive heat of dilution; the fourth, a positive temperature coefficient with a relatively large negative heat dilution. The Gibbs-Helmholtz equation applies rigorously in all cases, the difference being less than the probable experimental error.—*Phys. Review*, October.

Electrically Heated Oil-Tempering Baths.—H. Fulwider.—An illustrated description of oil-tempering baths heated by electric resistors. The advantages are absence of fire risk and ease of regulation of the temperature by means of a rheostat.—*Gen. Elec. Review*, November.

Units, Measurements and Instruments.

Electrolytic Watt-Hour Meter.—An illustrated description of a new electrolytic watt-hour meter of W. B. Thorpe. The meter is worked on the principle of the continuous electrolysis and recombination of water containing a small percentage of caustic soda in an hermetically sealed tube. Recombination of the evolved gases is effected automatically after a definite amount has been produced, and each recombination, corresponding to one or more units of electrical energy passed by the meter, is registered on a dial by an electromagnetic device. *E*, in Fig. 5, is the "registering" cell which is placed across the

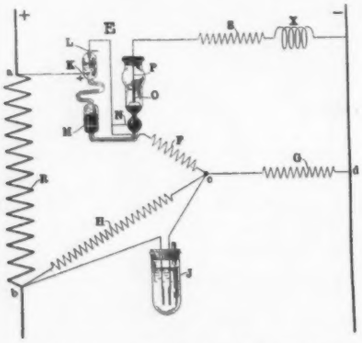
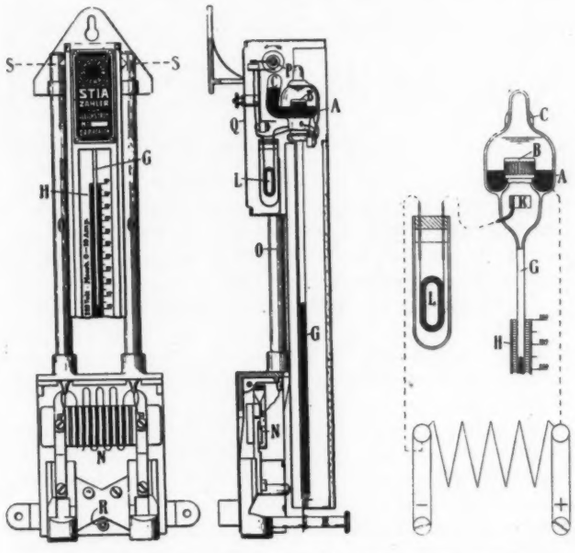


FIG. 5.—DIAGRAM OF CONNECTIONS OF ELECTROLYTIC WATTMETER.

mains in series with a resistor of high resistance *G* and another of high resistance *F*, the resistances being so proportioned that the pressure across *a c* is about equal to the back e.m.f. of the cell, while that across *a d* is the full line pressure of 100 volts or 200 volts. The other end *b* of the main shunt *R* is connected to the point *c* through a resistor *H;* therefore, neglecting the drop across *R*, the pressure across *H* is also about equal to the back e.m.f. of the cell. First, with regard to the effect of variations in pressure, a rise in the main voltage would cause a larger current to flow through *H* and *E* than normally and this would result in a rise of pressure across *b c* and *a c*. So it was necessary to devise a third parallel path to *E* and *H* which would take the extra current consequent upon the increase in the line pressure without increasing the drop across *a c* and *b c*. An electrolytic cell *J*, called the "absorption cell," is employed for this purpose. It comprises a test tube in which are two plates of nickel, 160 mm square, immersed in a 20-per-cent solution of caustic soda. If these nickel plates were infinitely larger, the cell would take any curent without any rise in the pressure across *b c*, which would remain at the critical voltage of the cell. Actually, however, they are of such dimensions that the pressure across *b c* (and therefore across *a c*) rises in proportion to the increase in the supply pressure to such a degree that the cell registers an increased amount, making the meter in effect a watt-hour meter. Practically no gas is generated in the "absorption cell." When the load circuit is open the various pressures are so balanced that the voltage across the registering cell *E* is very slightly more than the back e.m.f. of the cell. This balance is obtained in setting the cell in the first instance by adjusting the resistance of *H*, this being the only adjustment necessary to set or correct the meter. A very minute quantity of gas is evolved under these conditions, but this is occluded by the nickel electrodes, and does not influence the reading of the meter. Directly the load circuit is closed, however, current flows through *R*, and a difference of potential is produced between the points *a* and *b*. This difference of potential is immediately effective in driving a current through the cell *E*, as it raises the pressure across *a c*. This increase in the pressure being proportional to the drop across *R*, the water is electrolyzed in proportion to the current taken, and, further, any variation of the supply pressure is accompanied by a corresponding variation in the amount electrolyzed, so that the rate of electrolysis at any instant is proportional to the watts then being consumed by the load. At full load the cell takes a current of about 0.003 amp. The cell *E* is hermetically sealed, and therefore the electrolyte never requires replacing. Recombination is effected as follows: Starting with the left-hand bulb entirely filled with the electrolyte, a quantity of oxygen and hydrogen is evolved by the passage of current until, after one, or, in the large meters, two, units have been passed, the level has fallen to that indicated in the illustration. At this point the mercury in the bend of the arm has been displaced so that the wooden float *O* (which has platinum contacts at each end connected together) comes into contact with *P* and completes the circuit through the registering cell, the platinum contact *N* sealed into the mercury bulb, and the series resistor *S*. Immediately a much more rapid decomposition of the electrolyte commences, and continues for a second or so until the level sinks below the tip of the electrode *L*. A spark occurs when the circuit is broken here, and the gases are recombined so that the electrolyte again fills the bulb. The cycle of operations is then repeated. In series with the resistor *S* is an electromagnet *X*, which operates a registering dial of the ordinary pattern, causing it to record a further one or two units every time the circuit is completed. It should be mentioned that the presence of this inductive winding ensures a strong spark when the circuit is broken at the level of the electrolyte, thereby making recombination certain.—Lond. *Elec. Eng'ing*, Oct. 14.

Electrolytic Meter.—A description by the *Reichsanstalt* of an electrolytic meter made by Schott & Company which is thereby officially admitted for calibration. The meter is shown in Fig. 6. The electrolytic cell in series with the resistor *L* is in parallel with the manganin or constant in resistor *N* through which the main current passes. The current enters into the solution through the mercury surface *A* and leaves it through the iridium sheet *K* (Fig. 7). The mercury is dissolved by the current at *A* and is deposited at *K;* from there it falls in little drops into a tube *G* below *K*. The quantity of mercury deposited is proportional to the amp-hours. The electrolytic cell

consists of a glass globe, the lower part of which is turned inside and upward and a glass funnel is fused to this lower part. *B* is a grid of fine glass tubes, so arranged that the mercury cannot pass through, while the heavy salt solution above the mercury can flow off and can replace the dilute solution formed at the iridium sheet *K*. At certain intervals the meter



FIGS. 6 AND 7.—DIAGRAMS OF ELECTROLYTIC METER.

is tilted and the mercury is brought back into the container *C*. —*Elec. Zeit.*, Oct. 14.

Residual of Inductance and Capacity in Resistance Coils.—S. L. BROWN.—An account of an investigation tending toward the construction of a resistance coil for alternating-current measurements, in which the error due to inductance and capacity is avoided. Instead of seeking to make the inductance and capacity both small, the author proposes to offset one against the other, making the residual smaller than can be measured. If measurements of residuals less than a few hundred micromicrofarads are required, the latter plan offers noticeable advantages. The author first shows theoretically under which conditions with two parallel wires the inductance and distributed capacity will balance. He shows that the relation between the resistance, capacity and inductance is approximately the same when either interrupted direct current or alternating current of moderate frequency is applied to a coil of small inductance, With such a parallel-wire standard the outstanding difference between inductance and capacity in resistance coils can be measured. The author finds that a standard coil, made by twisting the wires together and separating consecutive turns, is not completely compensated for inductance and capacity when capacities of a few hundred micromicrofarads are to be measured.—*Phys. Review*, October.

Magnetic and Electric Tests of Steel.—A. GRÜNHUT AND J. WAHN.—A paper read before the International Association for Testing Materials on the proposition that the changes which the curves of magnetization and permeability, hysteresis, remanent magnetism, coercitive force, and electric conductivity undergo when the materials are mechanically stressed should afford suitable criteria for judging the mechanical properties of such materials. The author has made experiments with a view to investigating the influence of elastic stress (tension, compression and torsion) on the magnetizing curves of iron and steel, the test-rod or wire being submitted to external forces during magnetization. However, the influence of the stresses upon the magnetization of iron could not definitely be expressed. Weak magnetism was increased by tensile stress; strong magnetism was diminished; the curves depend upon the past history of the material; whether or not the iron has been put under stress before magnetization makes a difference. Compression has in general the opposite effect to tension. The slow loading and releasing of the specimen during the magnetizing process is not immaterial to the result. Both the temporary and the remanent magnetism left in the iron after the completion of the magnetizing process are influenced by the tensile stress; the relation, however, is not simple, and depends upon the intensity of the previous magnetization. Effects similar to those produced by tension and compression are observed when the specimen is subjected to cyclic torsion while under magnetization. Magnetic metals exposed to shear or torsion show different magnetic permeability in the direction of the different axes. A large number of measurements were made for ascertaining whether, and in what way, the elastic constants of iron and steel were influenced by magnetic forces. The only fairly established fact is that with increasing magnetization the moduli of elasticity, both for tension and shear, increase rapidly at first and more slowly afterward, somewhat after the manner of the changes in permeability; the variations in the moduli, however, are not large. In general, temporary magnetism increases with temperature—rapidly at first, then more slowly up to a maximum, to decrease rapidly again when this temperature is exceeded. On cooling, magnetism reappears, reattains its maximum, and decreases to the original value on continued cooling. There is, therefore, for every magnetizing force a critical temperature at which magnetism reaches its maximum, and, conversely, for every temperature there is a critical magnetizing force. Remanent magnetism diminishes by heating, and is altogether lost by heating to a high temperature. In this connection, first heating should be distinguished from repeated heating. When the material is kept at a strong glow, it loses its magnetism permanently after repeated cycles. Repeated annealing, therefore, affords an excellent means for producing demagnetization. The most favorable hardening temperatures for permanent magnetization are between 750 deg. C. and 850 deg. C. (1382 deg. Fahr. and 1562 deg. Fahr.). The authors have arrived at the conclusion that the interrelation between the various phenomena are not sufficiently uniform, so far as actual experience goes, to make it possible to determine the physical properties of a material from magnetic tests.—Lond. *Engineering*, Sept. 24.

Standard Cells.—H. L. BRONSON AND A. N. SHAW.—An account of researches partly conducted at the Bureau of Standards, Washington. Fifteen Clark cells were made according to the specifications of Wolff and Waters. Weston cells were also made, and some were brought over from Washington, and six more from the National Physical Laboratory. The agreement between the different Weston cells was, on the whole, better than that between the Clark cells. More cells were then constructed with the object of determining the influence of various modifications, especially in the preparation of the mercurous sulphate; a comparison was also made between cells of the (British) Board of Trade specifications and the Wolff and Waters cells. The ratio of the electromotive force of the Weston cell (adopted by the conference of the Normal Weston cell) to that of the Clark cell was ascertained to be 0.716953, against 0.716958 founded by Wolff and Waters.—Lond. *Engineering*, Sept. 24.

Cable Fault Localization.—E. RAYMOND-PARKER.—The first two parts of an illustrated serial on the practical working during last year of his method for cable fault localization by means of graphs. The article is to be continued.—Lond. *Elec. Review*, Oct. 8 and 15.

Measurement of Phase-Difference.—M. MIET.—A mathematical article on the application of the two-wattmeter method for the direct measurement of the phase-difference in a balanced or unbalanced three-phase system.—*L'Industrie Elec.*, Oct. 10.

Testing Machines.—E. F. COLLINS.—The first part of an illustrated serial on commercial electric testing of machines. After general introductory remarks the author discusses saturation tests and describes three methods, designed as generator saturation, motor saturation and ballistic saturation.—*Gen. Elec. Review*, November.

Telegraphy, Telephony and Signals.

Wireless Telegraphy.—W. H. Eccles.—The first part of an illustrated review of recent patents in wireless telegraphy. Several proposals for duplex working in wireless telegraphy have appeared. One method employs, at each of two corresponding stations, mechanical devices for switching the aerial rapidly to and fro between the sending and receiving circuits; another method leaves sending and receiving apparatus permanently connected to the air-wires and balances the effect of the sender on the local receiver by means of compensating circuits. Several examples of these methods are described and illustrated. The author also describes some recent improvements in sending apparatus and methods.—Lond. *Electrician*, Oct. 15.

NEW APPARATUS AND APPLIANCES

The Effect of Rotary Condensers on Power-Factor.

By John Liston.

While the relation of power factor to the size and efficiency of prime movers, generators and conductors has long been understood by the engineering fraternity, the practical application of the synchronous motor as a rotary condenser, to raise the power factor of systems having induction motor and transformer loads, has lagged far behind other improvements in the generation and transmission of energy.

The Cleveland Electric Illuminating Company was one of the first central stations to give a practical demonstration on an extended scale of the value of rotary condensers in raising the power factor of systems carrying a heavy inductive load. Their installations exemplify the use of unloaded synchronous motors simply "floated" on the system to supply leading current to the line and of partially loaded synchronous motors for the same purpose.

Before describing the installation of rotary condensers on this system, and the very satisfactory results which have been thereby obtained, it might be well to outline briefly the theory on which these installations are based.

Induction motors and other inductive apparatus take a component of current which lags behind the line pressure, and thereby lowers the power factor of the system, while a non-inductive load, such as incandescent lamps, takes only current in phase with the voltage and operates at 100 per cent power factor.

As transformers require magnetizing current, they may seriously affect the power factor when unloaded or partially loaded, but when operating at full load their effect is practically negligible.

In order to maintain high power factor, induction motors should be run at their full rated load. Due to the complex industrial requirements of the average installation, most central stations have on their lines a group of induction motors operating at light loads, thereby lowering the power factor of the entire system. This feature of central station practice is sometimes rendered still more serious by the desire of a customer to have ample power for future extension or to take care of heavy temporary loads, so that motors of larger rating than that actually required for normal operation are frequently installed.

The magnetizing current of an induction motor is nearly constant at all loads and is wattless, lagging 90 deg. behind the impressed e.m.f., or at right angles to the current which is utilized for power. It is evident that if the load is reduced, the power component is reduced while the wattless is practically constant, and hence the power factor is reduced. This fact explains the low power factor of induction motors on fractional loads and indicates that since the magnetizing current is practically constant in value, the induction motor can never operate at unity power factor. At no load the power component is just sufficient to supply the friction and windage and the power factor is reduced to 10 or 15 per cent and the motor takes from the line about 30 per cent of full-load current. It therefore follows that a group of lightly loaded induction motors can take from the system a large current at exceedingly low power factor.

The synchronous motor when used as a rotary condenser has the property of altering the phase relation between e.m.f. and current, the direction and extent of the displacement being dependent on the field excitation of the condenser. It can be run at unity power factor and minimum current input, or it can be over-excited and thereby deliver leading current which compensates for the inductive load on other parts of the system. The rotary condenser, therefore, can supply magnetizing current to the load on a system while the power component is supplied by the generators.

In order to gain a comprehensive idea of the results obtained by the Cleveland Electric Illuminating Company, a brief description of the generating and transmission system is necessary.

Situated in the city of Cleveland, Ohio, which has an estimated population of 515,000, and extends, with its suburbs, along Lake Erie for about 17 miles, the generating station, with its substations, serves a territory of approximately 50 square miles.

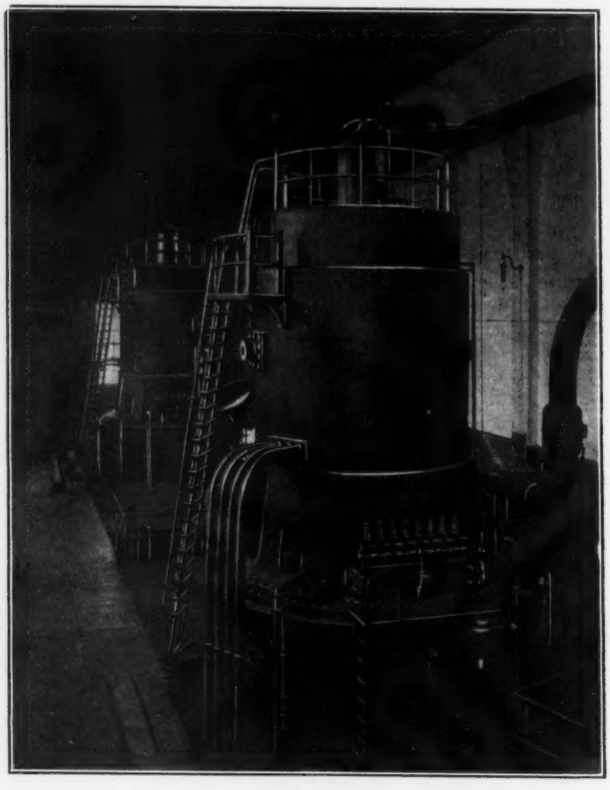


FIG. 1.—TWO 9000-KW CURTIS TURBO-GENERATORS.

The steam-driven generating station is located on Canal Street, near the business center of the city. The generating units now in service consist of two 9000-kw and one 1500-kw Curtis turbo-generator sets of General Electric manufacture, delivering energy at 11,000 volts, three-phase, 60 cycles. There are, in addition, some reciprocating engine-driven generators, delivering energy at 2300 volts, three-phase, 60-cycles. Transformers step-up the e.m.f. to 11,000 volts for the substations.

In addition to the alternating-current equipment there are three 1500-kw motor-generator sets and direct-current reciprocating engine sets and a storage battery. The energy for that part of the city immediately surrounding the generating station is distributed on a direct-current, three-wire Edison system. The balance is practically all alternating current, and is distributed to the substations at 11,000 volts, and redistributed at 2300 volts, three-phase, 60 cycles.

There are six substations, five of them being straight transformer stations, and the sixth being provided with a motor-generator set and battery in addition to the transformer equipment; the total distance between the two end substations is about 15 miles. All of the 11,000-volt circuits are under ground, being placed in vitrified clay or fiber conduits, the latter form having been adopted as a standard for all new work. The distribution circuits from the substations at 2300 volts for motors and lamps are underground cables for a short distance from the stations, where they join to pole lines. The secondary lighting circuits are three-wire, single-phase, 115 volts to 230 volts, and motors up to 5-hp rating are operated from the lighting circuits. The general inductive distribution is at three-phase, 2300 volts, the e.m.f. being stepped-down to 460 volts and 230 volts at the customer's premises.

The motors are nearly all three-phase, but some two-phase motors are run from three-phase transformers by means of a T-connection. The ratio of alternating-current to direct-current load is about 2.5 to 1. The arc lighting load is nearly all carried by Brush arc generator sets.

It will be seen from the above that the operating conditions confronting the Cleveland Electric Illuminating Company are

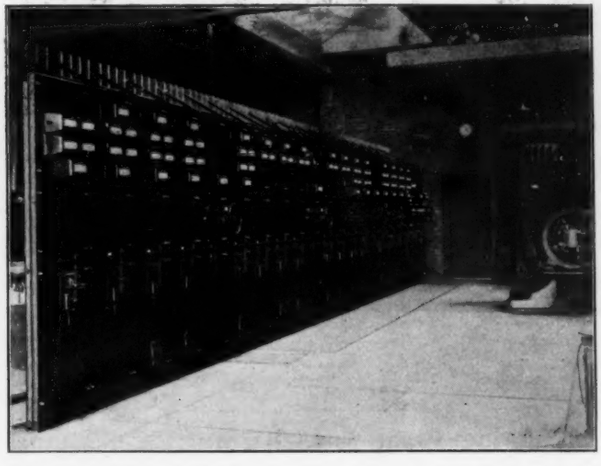


FIG. 2.—750-KVA ROTARY CONDENSER IN A SUBSTATION, CLEVELAND.

those which are ordinarily encountered by any central station located in a manufacturing city. The fact that more than 40 per cent of the connected load consisted of induction motors, which were frequently loaded far below their rated output, had a very noticeable effect on the power factor of the system, this effect being augmented by the numerous transformers located in the substations and on the customer's premises. So serious was this that the power factor of the entire system before the rotary condensers were installed varied between 65 and 70 per cent during the day, and at night, when the motor load was practically discontinued and the lighting load substituted, it rose to between 85 and 90 per cent.

Realizing that these conditions affected both the permissible output and regulation of the entire system, it was determined to bring the power factor as close to unity as was economically possible by the installation of rotary condensers in those substations feeding induction motor installations, and also in the factories of large motor users.

Two 2300-volt rotary condensers of 750-kva rating and provided with directly connected exciters were, therefore, installed in one substation, and a third unit of the same rating was provided for a second substation. In addition to these, four 200-kva General Electric rotary condensers with directly connected exciters were connected to the low-tension side of the transformers on the customer's premises; the largest motor users on the various distribution lines being selected for the installation of these units. As auxiliaries to the rotary condensers, a number of synchronous motors partially loaded were installed, the kilowatt load delivered to the shaft varying from 50 to 75 per cent of the kva rating of the motor. These motors are used to drive alternating-current or direct-current generators for special purposes, and are the property of the customer, while the 200-kva rotary condensers referred to above and installed on the customer's premises belong to the illuminating company.

The General Electric 200-kva condenser has been adopted as standard for future installations in customers' plants, but will not be provided except where the power taken is in excess of 400 hp. While this is not theoretically the best method, it was

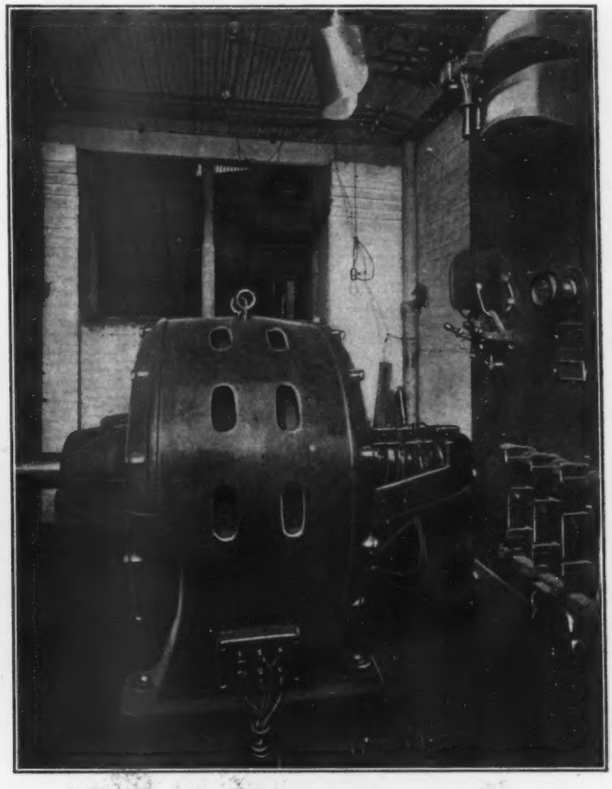


FIG. 3.—200-KVA ROTARY CONDENSER IN A CLEVELAND FACTORY.

considered advisable to have a single standard condenser placed in service where conditions warranted its use, instead of working out in detail a large number of various condenser ratings. The condensers thus installed are carefully inspected at frequent intervals by representatives of the illuminating company, but are normally operated by the customers, who are glad to provide the necessary room in their plants, as they benefit from the improved regulation.

A typical installation of this nature is that in the plant of the National Acme Manufacturing Company, makers of milled screws and "Acme" screw machines (Fig. 3). The motors in this plant are 440-volt, two-phase and have an aggregate rating of 1200 hp. The average demand on the substation is approximately 300 kw, and prior to the installation of the 200-kva condenser the power factor was about 75 per cent on this line; at the present time it is 90 per cent.

It will be noted that no rotary condenser has been located in the power house itself, the reason being that when a condenser is connected to the terminals of a generator it raises the power factor of the generator by supplying part, or all, of the wattless current of the load, but this wattless current has to be carried throughout the circuit external to the generator, and the

condenser therefore will benefit only the generating equipment.

When the condenser is installed at the end of a line carrying an induction-motor load and provided with step-up and step-down transformers, the condenser can supply magnetizing current to the induction motors located near it, and, as a result, the generators, transformers and conductors can be of reduced size, as they do not carry the wattless current.

In order to obtain most economically the required condenser effect with synchronous motors installed in industrial plants these motors should be partially loaded so that a percentage of their operating cost can be charged to useful output. It has been found that a synchronous motor used in this way and rated at, say, 100 kw, will give the best results when delivering 71 kw actual power and 71 wattless kva.

An example of a partially loaded synchronous motor is found in the plant of the National Electric Lamp Association, which is equipped with a 100-kw, 2300-volt to 430-volt alternating-current directly connected motor-generator set. (Fig. 4.)

At the works of the Ohio Ceramic Engineering Company a 100-kva General Electric synchronous motor has been installed, belted to a generator which loads it to about 60 per cent of its kva rating, the balance being utilized for condenser effect; this motor operates directly from the 2300-volt, 60-cycle feeder. (Fig. 5.)

The prompt recognition of the Cleveland Electric Illuminating Company of the serious effect of its inductive load on the power factor of its system and the improved general efficiency which has been obtained by the use of rotary condensers should appeal to every practical central-station manager.

A graphic illustration of the value of rotary condensers was given recently when one of the feeder circuits on the Cleveland Electric Illuminating Company's system was put out of commission during a storm, due to a tree falling across the line. This feeder was equipped with one of the 200-kva condensers already referred to, and while repairs were being made a feeder

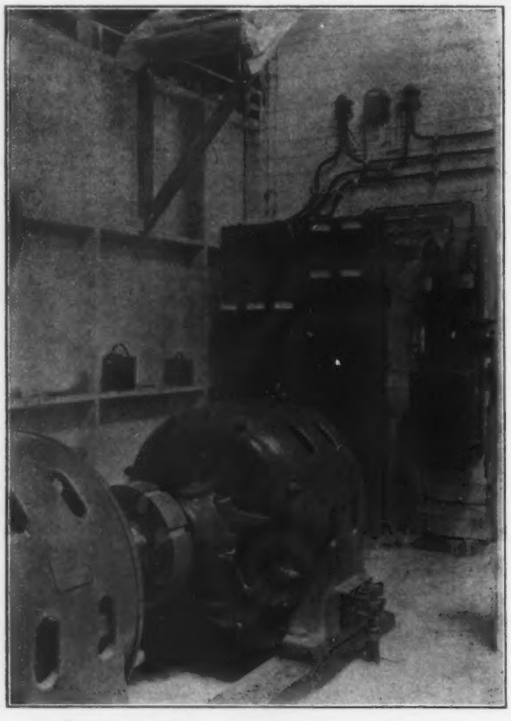


FIG. 4.—100-KVA SYNCHRONOUS MOTOR-GENERATOR SET IN LAMP PLANT, CLEVELAND.

from a different substation which was at the time carrying a heavy load at low-power factor, was joined to take on, temporarily, the additional load. It was found that the ammeter readings with this combined load were actually lower than they had been with a single load on the circuit not provided with a condenser. The kilowatt readings showed an increase of about 75 per cent, while the ampere readings dropped about 25 per cent.

The relative cost of condensers as compared with the investment losses in generators, conductors, etc., caused by low power factor, of course, depends on the percentage of the inductive load on a system; but the conditions which have to be met by the

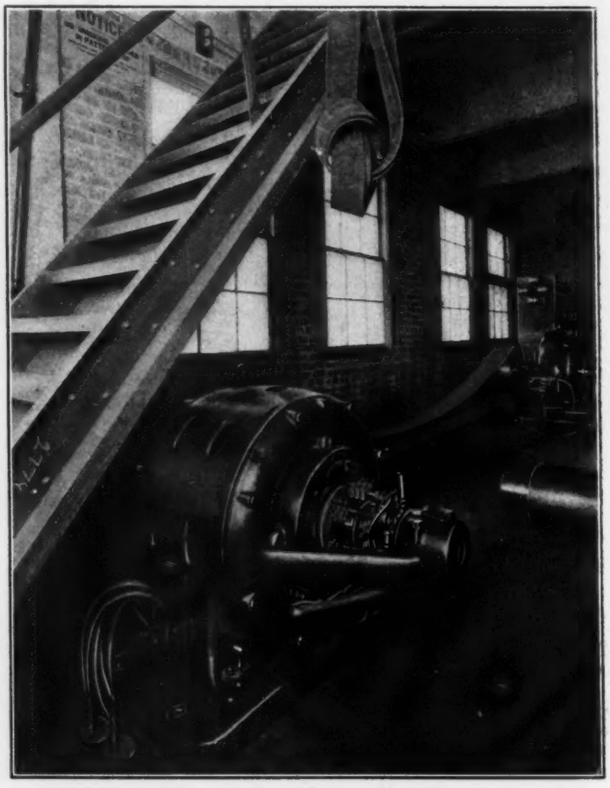


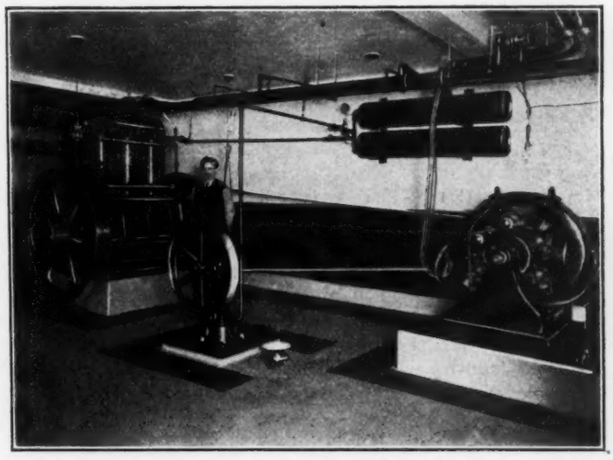
FIG. 5.—100-KVA SYNCHRONOUS MOTOR BELTED TO DIRECT-CURRENT GENERATOR, CLEVELAND.

average central-station distribution system indicate that the heat losses diminish effective output in generators and conductors, as well as the impaired regulation inherent in low power factor can be most economically overcome by the installation of rotary condensers.

Gas-Engine Plant for Charging Telephone Storage Batteries.

About a year ago the Colorado Telephone Company, of Denver, Col., found that its rapidly increasing business necessitated the installation of additional machinery for the purpose of charging the storage batteries. After some investigation, the company placed an order with the Hampson-Fielding Engineering Company, of Denver, for a 50-hp Nash gas engine, built by the National Meter Company, of New York. This engine was installed in the basement of the Main Exchange, on Champa Street, near Fourteenth Street, and at the time the installation was made much doubt was expressed as to the effect of the noise and odor attending the use of such a unit. The engine, which is a standard three-cylinder machine, uses illuminating gas from the mains of the Denver Gas & Electric Company through a 2-in. supply pipe. The gas has a thermal rating of 480 heat units, and, while it rarely falls below this rating, it possesses as high as 600 heat units. The foundation for the engine is built of concrete, and is separated from the floor of the building by a space of 1½ in. on all sides, the foundation extending to a depth of 4 ft. This arrangement was found to obviate all vibration. The engine is connected by a belt to a Western Electric 800-amp, 30-volt generator, and the equipment, which has been running for almost a year,

has developed its full rated horse-power on 21.6 cu. ft. of gas per brake hp-hour. The exhaust pipe of the engine is carried under the floor of the engine-room, through the wall and into an alley, the exhaust being discharged at the top of a nine-story building. The cooling water is provided from the city water mains, and the starting is effected by means of compressed air stored in a tank at a pressure of from 100 lb. to 120 lb. The noise and vibration, concerning which there were some misgivings at the time the contract was let, are unnoticeable, and the power cost of the plant is said to compare very favorably with that of a compound, non-condensing engine using coal costing $5 per ton. The accompanying illustration shows a view of the engine-room.



GAS-ENGINE PLANT FOR CHARGING STORAGE BATTERIES.

Electric Welding for Bonding Electric Railways.

A requisite of electric railway bonding is that the bonds shall not deteriorate from moisture, but hold indefinitely. There are two methods adopted to obtain the perfect weld implied, each of which requires a satisfactory flexible bond. These methods are electric welding and, so-called, copper welding.

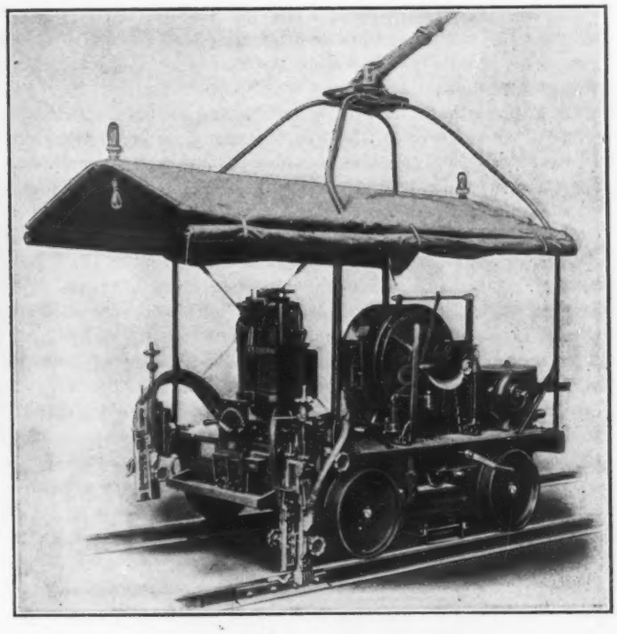
In the first method a heavy current is passed through the bond and the rail at the point of the weld, heating both to a sufficiently high temperature to weld them together. This requires a current of approximately 2000 amp at 5 volts. This may be obtained from the trolley line by means of a rotary converter and a special transformer, which lowers the voltage to the required amount.

The secondary terminals of the transformer are one of copper and one of carbon, so arranged as to clamp the bond and rail at the point of the weld. The flow of current heats the carbon terminal to incandescence and brings the rail and the copper bond to the welding point in from 45 to 60 seconds.

When the bonding is to be done by copper welding, molten copper is poured into a suitable mold and first heats the bond and the rail, and then forms the weld. The mold is of such shape that a large reservoir of metal is formed before the bond itself is covered. This insures thorough heating of the parts and is not wasteful of copper, as the reservoir is readily chiseled off after hardening and but a small neck connects it to the weld itself. This welding is particularly adapted to heavy bonds, return-feeder cable and around special work.

The illustration shows the outfit as supplied by the Electric Railway Improvement Company, of Cleveland, Ohio, which includes a standard Westinghouse 18-kw rotary converter and Westinghouse transformer. It will be noticed that the rotary converter may be used as a motor to propel the car. As high a speed as 30 miles per hour may be attained.

In order to remove the car from the rails to prevent interruption to traffic, a jack-screw is fixed under the center of the car. The weight of the equipment on the car is distributed to balance about the center, so that it is an easy matter to turn the car and roll it to one side and allow a regular car to pass. Economical bonding may be done on lines maintaining a five-minute service. For grinding the rail before welding, a small electric grinder, with leads and starting box complete, is provided.



APPARATUS FOR BONDING RAILS.

For rebonding lines in city streets this apparatus requires the removal of the paving blocks from a space of but a few inches wide and as long as the bond itself, which makes it economical for either new or old work.

Tungsten Lamp Shock Absorber.

This shock absorber, shown herewith, made by the Benjamin Electric Manufacturing Company, consists primarily of a strap-iron stirrup, a loose bushing centrally located, supported by a coil spring and tapped to receive the fixture stem. The compression spring forms a resilient connection between the supporting element (iron stirrup) and the fixture. The stirrup has two feet provided with screw holes for attaching to the supporting surface, and when so attached takes the place of an ordinary crowfoot. An additional strap, centrally threaded to fit a ⅜-in. insulating joint, is attached to the stirrup by means of two screws. This strap may be omitted for attaching to a wooden ceiling or block. In one case the device thus becomes a shock absorbing hicky; in the other, a shock absorbing crowfoot.

TUNGSTEN LAMP SHOCK ABSORBER.

Where it is desired to use brass casing and a canopy, a canopy

support consisting of ⅞-in. brass tubing with the upper end flanged outwardly passes through the opening in the bottom of the stirrup and surrounds the bushing. This permits the canopy to be attached by means of a ⅞-in. slip ring to the supporting element, thus leaving the fixture freely suspended, and effectually overcoming the difficulty of providing a means for preventing the transmission of shocks from the support to the fixture through the canopy and stem. There is also enough play between the movable parts to allow the fixture to hang plumb even though the support be uneven.

On either side of the stirrup are located machine screws, the purpose of which is to keep the bushing from being displaced. These screws, however, can be removed and the absorber taken apart for the purpose of changing the springs, or for removing or inserting the canopy support, which should be finished to correspond with the fixture. The device is furnished with one of these springs varying in stiffness to correspond to the weight of the fixture with which the absorber is to be used. The light spring will take a fixture from 1 lb. to 4 lb.; the medium, from 4 lb. to 10 lb., and the heavier, from 10 lb. to 16 lb.

In addition to other features, this shock absorber incorporates an essential for successful devices of this character, in that provision is made for locating it at the ceiling or the point of fixture support rather than above the individual lamp sockets. The initial shock of a sharp or sudden jar from the ceiling or point of support is intercepted before it reaches the fixture proper, while any subsequent vibration which might be transmitted is dissipated by the weight and consequent inertia of the fixture before it reaches the lamps themselves.

Inauguration of the Triumph Electric & Ice-Machine Company's New Plant.

On Saturday, Oct. 23, an informal reception was given to the employees of the Triumph company, their families and friends to celebrate the opening of the new plant at Oakley, Cincinnati.

An inspection of the plant, which is of the most modern construction, was energetically carried out by the entire party. An excellent band, located on the third gallery, discoursed music and younger members took advantage of the opportunities afforded for dancing. Refreshments were also served to the visitors. During the intermission several excellent speeches were made. The Deputy Mayor of Oakley welcomed the Triumph company in their midst and said that Oakley was proud to harbor such a progressive and up-to-date concern, and felt sure that the community at large would benefit thereby. It was a matter of gratification that Oakley would now be known all over the American continent; in fact, wherever modern machinery was in use.

A delegate of the Triumph employees spoke feelingly of the good fellowship and good-will that existed between the management and staff, and expressed a wish that such a feeling would long continue. Mr. J. C. Hobart, the manager, in reply referred to the value of "team work." He said that it was "team work" that had built up the Triumph company and had made the present buildings possible. It was "team work" that would eventually enlarge the plant to double or treble the present proportions, and he felt sure that if they continued to "pull together" as they had done in the past that the planned extensions would only be a matter of a few years.

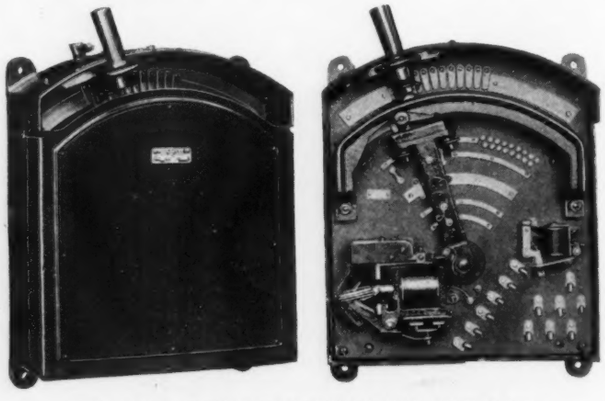
An energetic call for the president of the company brought Mr. W. N. Hobart quickly to his feet. He said that it afforded him considerable pleasure to see the employees, their wives and children all gathered together and he welcomed the opportunity to say a few words to them collectively. He pointed out in a very convincing manner that the interests of the company and employees were identical. The advancement of the company meant better conditions and advancement for the men, and reflected naturally to their wives and families. He fully believed that each and every man had the interest of the company at heart, and cited as a proof of this the remarkable celerity with which the old factory had been dismantled and the new plant fitted up. He hardly believed that such a feat was possible, and it spoke volumes for the zest and energy of the men that it had been accomplished in such a short time.

The new factory is 300 ft. long, three stories high and 140 ft. wide, and provides some 125,000 sq. ft. of floor space. The building represents a capital outlay of approximately a quarter of a million dollars, in addition to which over $50,000 worth of new equipment has been purchased. The increased facilities so obtained will enable the Triumph company to turn out even better and more rapid work than heretofore.

Printing-Press Motor Controller.

In no application of individual electric drive to industrial purposes is the desirability of a properly designed controller better exemplified than in printing. The requisites of a wide speed variation and an ability to bring the driving motor to rest quickly have necessitated a special design of controller for this industry. A controller developed by the General Electric Company for this purpose is shown in Fig. 1 and Fig. 2 is a view with the enclosing cover removed. As will be observed, the control is obtained by means of a single handle which projects through a slot in the front of the case. All external wiring passes through a slot at the bottom.

A range in motor speed of 3-to-1 is obtained by variation in the armature and field circuit resistances. The operating handle will remain on any resistance point for forward running, but will automatically spring back to the "off" position from the reverse point.



FIGS. 1 AND 2.—PRINTING-PRESS MOTOR CONTROLLER.

A valuable feature of this controller is the use of a contactor for making and breaking all main circuits. The movement of the handle energizes the contactor and closes the motor circuit. An overload device protects the motor from too rapid acceleration or an overload at any time. Should the contactor drop out, either by reason of an overload or failure of voltage, the operating lever must be returned to the "off" position before the contactor can again be energized.

A quick-acting braking effect is provided by means of a dynamic brake resistance circuit acting automatically when the motor circuit is broken.

A feature of especial value to the printing trade is the remote push-button control. A single push-button may be used to either start the motor or bring it to rest quickly from any running position. This arrangement gives the operator perfect control when "setting up." Push buttons may be installed at any number of convenient points.

The resistors for the armature and brake circuits are contained in separate boxes arranged for mounting on the wall or any other convenient place. The resistors are made up of single resistance units, which may be easily replaced. Ample ventilation is provided for insuring a low-operating temperature.

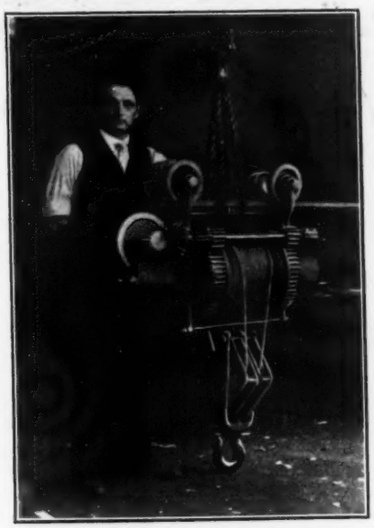
Gas-Electric Motor Cars for Southern Railway.

The General Electric Company has sold to the Southern Railway Company two of its latest type of gas-electric motor cars. These cars will be equipped with standard commutating pole railway motors of 100 hp. Two of these motors are located on the forward truck, giving a motor capacity of 200 hp to each car.

The current is supplied from a 600-volt generator, which is direct coupled to an eight-cylinder gas engine in the forward compartment. A controller similar to that used on an ordinary trolley car is located convenient to the operator, and through this the current passes from the generator to the motors. Combined straight and automatic air brakes will be provided, with the usual valves and accessories. The car bodies will be of steel, about 55 ft. long, with a seating capacity of 52 passengers. Both rear and center entrances are provided, thus furnishing a convenient means of dividing the two classes of passengers, as required in the South. The car bodies will be illuminated by electric light throughout. The order for these cars was placed only after a thorough test on the Southern Railway of this type of car between Manassas and Strasburg last summer.

Electric Hoist.

The accompanying illustration shows an electric hoist built by Gustav Rasmus, 514 West Fifty-seventh Street, New York, which embodies some rather novel features. In order to make the hoist as small as possible, without forfeiting strength or durability, the field of the motor is made the drum of the hoist. A standard type of motor is dismantled, the pole pieces being placed in the drum of the hoist, and the brushes and armature inside the drum between the two drum gears which form the front and rear casing of the motor. By the reduction of these parts, and by placing the armature within the drum, a number of casings and braces necessary to hold the motor in alignment with gears and drum are done away with. In order



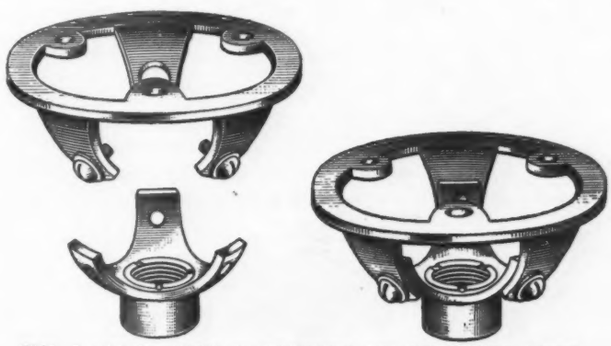
ELECTRIC HOIST.

to limit the friction to a minimum, the armature and the drum are designed to rotate in the same direction, the hubs of the drum gears being the bearings of the armature shaft. A feature of the design is a worm keyed to the armature shaft, thus eliminating the necessity of a load brake and a speed brake.

The motor is electrically controlled for speed, and when at a standstill the gears are locked in position by the worm. The hoist is supported by four flanged wheels mounted on slightly inclined studs in the suspending yokes. The hubs of the drum gears are journaled in the hoist frame, and through their hollow trunnions extends the armature shaft of the motor. The commutator and controlling apparatus are located at one end, and on the opposite end, on the extended armature shaft, is a worm engaging a worm wheel, which through beveled gears drives a shaft parallel to and above the armature shaft. This shaft carries pinions meshing the drum gears. The motor is of the bipolar type, and a limit switch is provided to break the circuit when the hook reaches the top of its travel. A five-ton electric hoist is said to require only 35¾-in. head room and to weigh 500 lb.

Separable and Adjustable Tripod for Electric Fixtures.

The Emery separable and adjustable tripod, or crowfoot, made by the Fairmount Electric & Manufacturing Company, of Philadelphia, Pa., comprises a top and lower portion, as shown herewith. The top portion is first screwed firmly to the wall or ceiling and the lower part screwed to the fixture. The lat-



FIGS. 1 AND 2.—PARTS OF SEPARABLE AND ADJUSTABLE TRIPOD.

ter is then hung on the top portion and the screws inserted in the fixture.

The advantage of this construction is that the workman is not compelled to bear the weight of the fixture while screwing up the tripod as in the old method, so that he is free to secure the tripod more firmly and more easily which is not the case if he must hold the fixture at the same time. The tripod also permits of adjustment where the ceiling is irregular or the thread is not true, so that it is not necessary to resort to blocks of

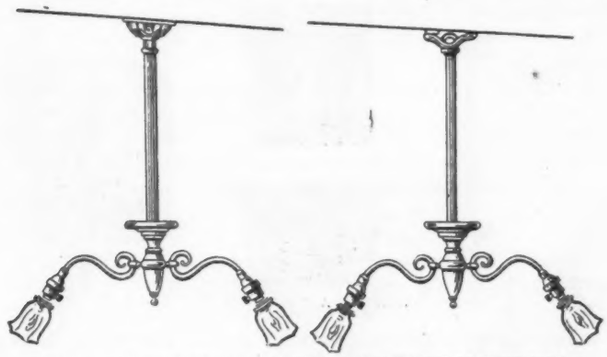


FIG. 3.—THE NEW AND OLD WAYS OF HANGING FIXTURES.

wood to bring the fixture plumb. Moreover, the method of using a block of wood under the older type of tripod has much to condemn it, as in time the block becomes loose due to vibration and jars to which all fixtures are subject. The dropping of the block takes away from the rigidity of the fixture, which cannot be made secure again except at some expense. Fig. 3 herewith clearly illustrates the old and the new way of hanging fixtures and also shows the advantages of the adjustable tripod.

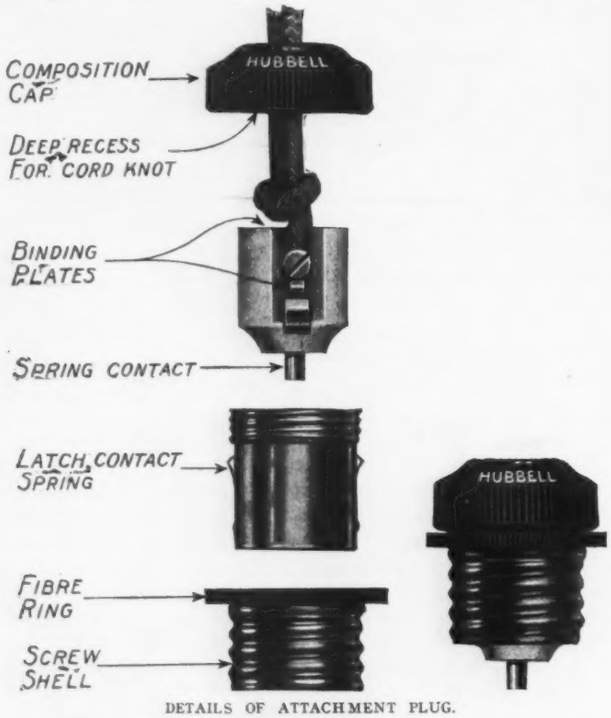
Train Dispatching by Telephone.

A telephone train-dispatching circuit between Raleigh and Monroe, N. C., a distance of 148 miles, has been used with excellent results during the past two months by the Seaboard Air Line Railway. The dispatcher's office is located at Hamlet, 53 miles from Monroe and 95 miles from Raleigh. There are 29 selector stations placed along the route.

The dispatcher's telephone equipment consists of three sets of head receivers and breast transmitters, with cord and plug attached. The sending cabinet is equipped with individual-call keys, one for each way station. The selectors at the way stations are of the main-line bridging type wound for 4500 ohms. By means of graduated resistance inserted in series with the individual selectors each selector receives about 8 milliamperes of current independent of its distance from the dispatcher's office. Between Monroe and Hamlet there is in service a special composite block telephone system, while between Hamlet and Norlina, a distance of 154 miles, there is a magneto-telephone block system. The telephones and terminal devices were furnished by the Western Electric Company.

Small Attachment Plug.

In making attachment plugs for use with ornamental lamps and the great number of electric household devices, the manufacturers have striven to get a smaller plug; because if smallness and sturdiness could be combined such a plug would be preferable to the large, and oftentimes unsightly, plugs heretofore used on household circuits. Harvey Hubbell, Inc., of Bridgeport, Conn., claims several features of merit for the



DETAILS OF ATTACHMENT PLUG.

attachment plug shown herewith and known as "5601." This is a separable attachment device with a push-in cap which, when given a slight pressure, snaps into a metal base. When the cap is inserted two stiff contact springs grip a groove in the base and the cap is held securely against vibration and undue strain on the cord. The push-in cap prevents twisting of the cord, while its action is smooth, quick and definite. The poles are in plain sight and there are no small parts or screws to handle, consequently the actual wiring of the plug is very simple. The total length of the plug is 1¾ in., and when in use the only visible parts are the cap and the thin fiber ring, both of which project ½ in. from the socket shell.

Theatrical Ad-o-Scope.

The little machine, illustrated herewith, is the latest application of electrical effect for theatrical purposes, and was exhibited by the Feature Advertising Company, Metropolitan Tower, New York, during the recent Electrical Show in Madison Square Garden. It is at present used by the New York, Gaiety and Herald Square theaters, where it may be seen every afternoon and evening flashing pictures of the artists and scenes in the play. This device, as its name implies, is a miniature "News Ad-o-Scope," which was described in our columns a short time ago, and seems to have solved a problem that has vexed managers for years, namely, how to reproduce,

THEATRICAL AD-O-SCOPE.

in the limited space of a theater lobby, pictures of artists in colors, illuminated from behind. Other stereoscopic projections usually require a distance of from 15 ft. to 20 ft., while the dimensions of this machine are 50 in. in height, 42 in. in width and 18 in. in depth.

By means of the "Ad-O-Scope" it is possible to show, not only the portraits of the artists, but to reproduce by stereoscopic projections a complete play, scene by scene and act by act. The photo-slides, 30 in number, are turned by an electric motor, and may be changed and new ones inserted within a few minutes.

Novel Low-Pressure Turbine Installation in Akron, Ohio.

The Allis-Chalmers Company has recently received an order from the Diamond Rubber Company, of Akron, Ohio, for a rather novel installation. This will be a low-pressure turbo-generator set receiving its steam supply from the exhaust of the vulcanizers and other apparatus. The set has a capacity of 1000 kw when running at 1500 r.p.m. and will furnish 25-cycle, two-phase, 240-volt currents. The turbine will have a continuous overload capacity of 1250 kw. The initial steam pressure will be about 16 lb. absolute and the vacuum from 26 in. to 28 in., depending on the temperature of the condensing water at various seasons of the year. In connection with this turbine the Allis-Chalmers Company is furnishing a special condenser outfit.

The conductor head will be connected to the expansion joint of the exhaust line where it leaves the turbine. The mixture of steam, water and air coming from the head will be removed by a centrifugal pump driven by a small impulse steam turbine. The dry-air pump will be driven by a small reciprocating engine. Both these auxiliaries will run on high-pressure steam and the exhaust from them, which will be at atmospheric pressure, will be used in the large low-pressure turbine, which makes a most economical arrangement.

Crude-Oil Engine Internal Combustion.

An interesting type of internal combustion engine has recently been brought out in England, the manufacturers being Blackstone & Company, Rutland Works, Stamford, Eng. Crude oil, such as those of Texas and Russia, and also, it is stated, petroleum residue, may be used in the engine efficiently without the aid of abnormally high compression. Ordinary refined petroleum may also be used. One of the main features of the type is that the compression of the charge is comparatively low, namely, 150 lb. per square inch. The fuel is injected into the cylinder at or near the end of the compression stroke with a pressure of about 400 lb. per square inch. To ignite crude oils with a compression of only 150 lb. some additional means had to be provided. This consists in the employment of a dual spraying device, consisting of a main jet adapted to deliver a charge into the combustion chamber, and an auxiliary one delivering a similar charge into a bulb-shaped ignition chamber, heated at starting by a lamp, and afterward kept incandescent by the combustion of the fuel. This ignition chamber communicates with the combustion chamber by a port so arranged that the flame produced in the chamber impinges upon and ignites the main fuel spray in the combustion chamber. This oil is delivered from a tank to the spraying device by a governor-controlled pump, and first reaches the auxiliary or igniter spray, all oil in excess of the quantity required for this purpose overflowing into the main spray. This method insures a charge of oil being injected into the igniter at every cycle, thus keeping it hot irrespective of the engine running light or loaded.

A principal object kept in view in the design of the engine was to prolong the initial pressure of the explosion in the cylinder, which, it is claimed, has been done so successfully that the indicator card is parallel to the atmospheric line for a considerable distance along the working stroke, thus resembling the cards obtained from a steam engine working with a good cut-off. It was found by experiment that this object could not be obtained by injecting the whole of the fluid charge at the end of the compression stroke, so means were provided by which the injection of the charge is sufficiently prolonged to keep the pressure in the cylinder at its maximum during the first portion of the working stroke. To effect this purpose an oil reservoir is provided in conjunction with the main spraying valve into which the surplus oil from the igniter flows. This chamber is so formed that it is not immediately emptied when the spraying valve is opened, but a further supply of fuel is forced into the combustion chamber as the working stroke proceeds, thus maintaining the combustion and the pressure for a considerable portion of the stroke. A governor of the centrifugal type controls the speed of the engine by regulating the stroke of the oil pump, which is done by inserting or withdrawing a wedge-shaped packing piece between the end of a slot formed in the pump plunger and the end of the bell crank lever which actuates the pump.

New Appliances at Illinois State Electric Convention.

At the Illinois State Electric Association convention, held at Alton, Oct. 26 to 28, exhibit space was offered free to exhibitors in the basement of the Illinois Hotel. These facilities were taken advantage of by a number of supply companies. Many of the exhibits were of well-known appliances, but a few of the new things exhibited should have special mention.

The Pacific Electric Heating Company, maker of "Hot Point" irons, exhibited for the first time the "Utility Hot Point" iron. This is a small iron intended for the use of travelers and is put up in convenient shape for traveling. The iron alone weighs a little more than 2 lb. Besides being an iron, the appliances with it make it possible to use it as an electric stove and an electric curling tong heater. There is a stand by which the iron can be placed bottom up and used as a stove. A pan the shape of the iron is supplied with the outfit and can be used for heating water or other reasons. This pan serves as a receptacle for the iron when it is packed up. A receptacle in the iron takes a curling tongs. The whole outfit is placed in a neat leather bag for carrying. It weighs about 3¼ lb. The Pacific Electric Heating Company is getting this set out for holiday trade, and it should prove very popular. It is, of course, not to be recommended for heavy ironing, but is a very useful article to have around the house, even if it is not used when traveling.

The Holophane Company showed for the first time its new line of extensive and focusing D'Olier reflectors for use with pendant lamps. These extensive reflectors, when hung low over a workbench, give a wide distribution of light under the lamp, and at the same time completely cover the lamp.

The Central Electric Company has a new pothead for high-tension cables up to 12,000 volts. This pothead has high-tension insulators, through the center of which the high-tension cables are brought out. The external form of the insulators is similar to other high-tension insulators.

The American Washer Company, of St. Louis, had the Jewell electric washer in operation with motor drive. This washer is similar to those used in large laundries, being of the revolving barrel type.

The new P-M meter testing system shown by the Central Electric Company attracted much attention. This consists of a pressed sheet-steel box containing the consumer's meter and a main line cut-out equipped with certain receptacles into which plugs from a test meter can be placed. The consumer's meter can be short-circuited by means of these plugs so as not to interrupt service to the consumer while the test is going on. The meter can then be tested by the connection of an artificial load. The main object of this arrangement is to save the large amount of time taken by meter tests in connecting up and getting ready to test consumers' meters. This is a considerable percentage of the total time required in testing. The enclosing box also protects the service and meter terminals from tampering and theft of electricity.

The Jandus long-burning flaming-arc lamp of the regenerative type was shown. This burns 70 hours with one trim of carbons. The mechanism is simple and the lamp is easily cleaned and trimmed. The distribution of candle-power about the lamp is such as to make it well suited for lighting large areas. The maximum candle-power is about 50 deg. from the vertical instead of directly underneath the lamp as in most other types of flaming-arc lamps.

Industrial and Commercial News

Commercial Intelligence.

THE WEEK IN TRADE.

The condition of trade during the past week continued to improve. This is an old story. Every week shows additional expansion over the week previous, and the entire sentiment of the business world is one of buoyancy. Altogether the situation is considered so satisfactory, and the promises for the remaining months of 1909 are so bright, that many business men are predicting that the year will be close to the top record for general prosperity. Industry is leading in the upward movement; manufacturers are book-full with orders; overtime is the rule in many sections, and there are beginning to be complaints of the insufficiency of skilled labor. The mild weather has stimulated retail trade in all sections, and many fall festivals have done much to increase business. The jobbing trade has kept pace with the retail trade, and the distribution of goods, especially dry goods and clothing, has been very liberal. Buying for the holiday trade has also been active, and orders for spring delivery are coming in. During the past week the New York Central Railroad placed contracts for 325 locomotives, 197 passenger cars and 17,850 freight cars. Contracts are already arranged for the purchase of 165,000 tons of new steel rails to be delivered in 1910. It is said that the total expenditure of this road for new equipment will be close to $25,000,000. It is announced that the great Pennsylvania Railroad shops at Altoona are working either overtime or full time; that 12,000 men are employed and that the rush to put equipment into good condition is greater than ever before known. As a reflection of the increase in business, it is worth noting that the interest and dividend disbursements for November will show an increase of almost $8,000,000 over the same month of last year. This indicates the better condition of both railroads and industries, and does not include in the calculation of earnings the financial institutions. The one gloomy report from the industrial world comes from the cotton mills, where there is a movement on foot to curtail the output. This is due to the low prices now prevailing for cotton goods, and the high price that is demanded for raw material. Many of the mills, especially those in the South, claim that the output must be reduced until prices adjust themselves. Collections are practically normal, and there is no complaint heard from wholesalers and jobbers. Business failures for the week which ended Oct. 28, as reported by *Bradstreet*, were 217 against 244 the previous week; 241 in the same week in 1908; 233 in 1907; 163 in 1906, and 160 in 1905.

THE COPPER MARKET.

During the past week the copper market has been more or less excited, and fluctuations have been rather violent. The net result of the week's trading, however, amounted to only slight advances over the close of the previous week. There is much evidence that the copper market is being manipulated in the interest of Wall Street, and that there is more attention paid to speculation in copper securities than there is to the actual copper industry. A revival of the speculative interest in London caused a considerable advance in the price of standard warrants in that market. Before this movement began there was quite active buying of electrolytic copper by foreign consumers, and it is stated that the prices at which this copper was sold were more favorable to the melters than any that could be obtained by domestic consumers. The result of this is that domestic buying has been light. Another feature which has tended to excite the local market is the persistent rumor that a large copper combination is pending, which will include the leading interests of both America and Europe, and will practically dominate the copper industry of the world. John D. Ryan, president of the Amalgamated Copper Company, declares that there is nothing whatever in these reports, but the fact that numerous lengthy meetings have occurred at the Amalgamated offices keeps Wall Street talking of combinations. One report has it that J. P. Morgan & Company are to do the financing, and that W. E. Corey, of the Steel Corporation, will take active management. Whether this is nothing more than the gossip of the "customers' room," or whether huge plans are being matured, makes little difference in Wall Street. The prices of copper stocks have advanced sharply, and Amalgamated shows a gain of 7⅛ points on the week. For the month of October it seems probable that there will be an accumulation of copper of about 30,000,000 lb. Exports for the month are estimated at about 23,000 tons. On the Metal Exchange Oct. 30 standard copper was quoted as follows:

	Bid.	Asked.	Settling price.
Spot	....	12.50	....
October	....	12.50	12.25
November	....	12.50	12.25
December	....	12.50	12.25
January	....	12.50	12.25

The London prices Oct. 29 were as follows:

	Noon. £ s d	Close. £ s d
Standard copper, spot	57 15 0	57 12 6
Standard copper, futures	58 17 6	58 15 0
Market	Strong	Easy
Sales of spot		1200 tons
Sales of futures		2800 tons

Extreme fluctuations for this year:

	Highest.	Lowest.
Standard	13.00	12.12½
London, spot	£64 2 6	£54 12 6
London, futures	64 17 6	55 10 0
London, best selected	67 15 0	59 0 0

RUTLAND (VT.) RAILWAY, LIGHT & POWER COMPANY.—It is stated that the Rutland Railway, Light & Power Company will extend its line from Poultney, Vt., to Granville, N. Y. Arrangements have been made to finance the construction of this railway from a point on the main line near Castleton, through the slate quarries to Poultney. The road will only be built provided a free right-of-way is granted, and that there is no trouble in securing the proper franchises. The company will supply energy for light and power along the route.

EAGLE PASS, TEX., INDUSTRIAL PLANT.—Plans are now under way and being matured by the Eagle Pass (Tex.) Industrial League, for the organization of a company to construct a hydroelectric power plant. The plans include the purchase of the local electric light, water and ice plants, all of these properties to be operated by electricity. It is also contemplated that sufficient energy will be developed to furnish power for industrial plants in Eagle Pass, Tex., and in Porfirio Diaz, across the Rio Grande River in Mexico.

OTTER TAIL POWER COMPANY.—A proposition has been submitted to the city of Fergus Falls, Minn., by the Otter Tail Power Company to furnish energy to operate a lighting plant for a term of 10 years at 2½ cents per kw-hour for the first 200,000 kw and 2¼ cents for the second 200,000 kw. This proposition covers energy which is delivered at the city switchboard, and the contract is made on the condition that the city will not furnish electricity for power purposes within the next 10 years.

ALLIS-CHALMERS SALES.—Among recent sales of the Allis-Chalmers Company are the following: Twenty-five direct-current motors to the Buffalo plant of the Lackawanna Bridge Company, which follows an order given in August for a 200-kw generator and 21 motors. To T. F. Fullerton, Sapulpa, Okla., a 360-hp, 60-cycle, three-phase, 2300-volt gas engine generating unit and exciter. To the U. S. Navy Department for the Philadelphia Navy Yard, three 100-kw motor-generator sets, two 25-kw exciter sets and a 27-panel switchboard. To the McKeesport, Pa., Tinplate Company, for its Port Vue plant, two 300-kw direct-current type generators and 19 direct-current motors. To the City of Greenville, Tex., two 300-kw, 60-cycle, three-phase alternators directly connected to cross-compound engines, an induction motor-driven exciter and switchboard. To the Cleveland Worsted Mills, a duplicate order for its Ravenna factory, consisting of a 1500-kw, 60-cycle,- three-phase alternator direct-connected to a cross-compound Corliss engine. To the Starr Manufacturing Company, Carpentersville, Ill., a 300-kw, direct-connected hydro-electric unit, 300-kw belted alternator, exciters for the above, fifty-two 440-volt induction motors, and switchboard. Orders for transformers varying in size from

200 kw to 1500 kw have been received from the Great Western Power Company and Pacific Gas & Electric Company, San Francisco; Bear Lake Power Company, Montpelier, Idaho; Portland Railway, Light & Power Company, Portland, Ore.; Sacramento Valley Power Company and Los Angeles Gas & Electric Company.

BUILDING A MONORAIL LINE.—With some ceremonies, at which the president of the Board of Aldermen turned the first spadeful of dirt, construction was begun, Oct. 28, upon the monorail railway line which will be built from Bartow station, on the New York, New Haven & Hartford Railroad, to City Island, N. Y. The line will be three miles long, and the greater portion of it will run through Pelham Bay Park. The line is being constructed by the Monoroad Construction Company, of which Bion L. Burrows is the president. Some time ago a syndicate, represented by Mr. Burrows, purchased the capital stock of the Pelham Park Railroad Company and the City Island Railroad Company, two short connecting horse lines. The Monoroad Company was then organized, and issued $100,000 worth of bonds, the stock of the two railroad companies being put up as collateral. Mr. Burrows says that this furnishes ample money for the construction of the road. The Interborough Rapid Transit Company is back of the enterprise. The Monoroad Company owns the rights, by purchase from the American Monorail Company, for that system of construction in the metropolitan district around New York. It is proposed to construct a small power house on City Island, where a waterfront site has been secured, to furnish the energy for the operation of the line. The rails will be laid on concrete ties, and the pedestals of the steel pillars which support the upper trolley will also be made of concrete. Three cars will be constructed, built of steel and aluminum. They will weigh only 15 tons, and Mr. Burrows is confident that a speed of 100 miles an hour will easily be obtained. The road expects to be ready for operation next summer.

NEW SUBWAYS VOTED.—The Board of Estimate and Apportionment of New York City last week authorized the issuing of $15,886,381 of bonds for the construction of what is known as the Fourth Avenue Subway in Brooklyn. This amount represents the contracts already let by the Public Service Commission, and there is now no reason why the work of construction should not proceed as soon as the consents of the property holders have been obtained. The subway will be four track for express and local trains, much the same as the existing subway in Manhattan, except that it is proposed to build separate tubes for each track for purposes of ventilation. So far the line contemplated only extends to Forty-third Street in Brooklyn, but plans are drawn for the extension to Ft. Hamilton, and from there to Coney Island. The Public Service Commission has already let contracts for this work as follows: For the first section, from the Brooklyn approach of the Manhattan Bridge to Willoughby Street, James F. Graham; for the second and third sections, from Willoughby Street to Ashland Place and from Ashland Place to Sackett Street, William Bradley; for the fourth and sixth sections, from Sackett Street to Tenth Street, and from Twenty-seventh Street to Forty-third Street, the F. S. Smith Contracting Company, of Philadelphia, and for the fifth section, from Tenth Street to Twenty-seventh Street, the Tidewater Building Company and Thomas L. Bryson. The contractors have been notified to execute their bonds at once.

REPRESENTATIVES OF LAMP COMPANIES ON WESTERN TRIP.—Messrs. F. S. Terry and B. G. Tremaine, of the National Lamp Company; Walter Carey, of the Westinghouse Lamp Company; A. D. Page, of the Edison Lamp Company, and C. I. Hills, of the Franklin Electric Lamp Company, are making a joint trip in the West in the interests of their respective companies. In an interview in a Denver newspaper, F. S. Terry said that every two or three years the four large manufacturers of incandescent lamps sent out representatives to visit the jobbers in the various cities of the country, and these traveled together in order to be able to meet the jobbers of the different cities at once, thereby saving time and holding a sort of convention in each city visited. The present trip extends from Chicago to the Pacific Coast, touching Portland, Seattle and important intermediate points. A visit to the South will be made upon the completion of the present trip.

TRADE IN INSULATED WIRE.—Reports of companies that manufacture insulated wire state that trade is rapidly improving, and that the demand for wire is better than at any time since before the panic. This business has been a trifle slow in coming, because the wiring contracts are usually the last that are made in connection with new buildings and because telephone extension is just beginning. The state of the trade is not altogether satisfactory, however, owing to the existence of some demoralization in prices. An official of one of the older companies declares that the market has been flooded with cheap wire, manufactured with poor insulation made up mostly of resinous materials, which goes to pieces within a few months. On account of this condition, an effort is on foot among the engineers of several of the principal manufacturing concerns to have a meeting with the Board of Underwriters and prepare stricter specifications for wire insulation. This movement is as yet only in an embryonic state.

ST. LAWRENCE RIVER POWER COMPANY.—The Cornwall (Ont.) Board of Trade has petitioned the Dominion Government to grant a franchise to the St. Lawrence Power Company for utilizing the channels of the river for a hydroelectric plant. This concern, associated with an American company, has already spent $1,000,000 in purchasing sites, etc. The first dam, which will cost $4,000,000, is to be built at the foot of the South Sault Channel, where it is expected from 65,000 hp to 70,000 hp will be devoloped. Later, another dam is to be constructed at the foot of Sheeks Island on the Canadian side, and finally, when needed, a dam will be built at the foot of Barnhart's Island, across the main channel of the St. Lawrence. At the first dam a lock is to be erected by which vessels will be able to take the whole 40-ft. drop at one lift, whereas six are now required in the Cornwall Canal. The company proposes to supply all demands for power in that section.

ATLANTIC COAST LINE INSTALLS TELEPHONES.—The Atlantic Coast Line has in process of construction, and will shortly put into service, a telephone train-dispatching circuit from Richmond, Va., to South Rocky Mount, N. C., a distance of 121 miles. The dispatcher for this circuit will be located at Richmond. There will be 32 selector way stations and two local telephone stations in the chief dispatcher's office and the superintendent's office at Richmond. These stations will be called by means of a buzzer. The transmission line is constructed of No. 9 B. & S. copper, 210 lb. per mile. Western Electric telephone apparatus and Gill selectors are used throughout. The Western Electric Company reports that within the past six weeks three other railroads have placed orders for telephone train-dispatching circuits leading out of Richmond. These are the Chesapeake & Ohio, Richmond, Fredericksburg & Potomac and the Seaboard Air Line.

CENTRAL COLORADO POWER COMPANY.—Negotiations have been closed between the Northern Colorado Power Company and the Central Colorado Power Company whereby the former company will secure energy from the hydroelectric plant of the latter company located in Boulder Canyon. The Northern Colorado Power Company has a large steam plant at Lafayette, but the customers of the company have increased so rapidly that the demand is now greater than this plant can satisfy.

MEXICO STEEL & CHEMICAL COMPANY.—The new organization of the Mexico Steel & Chemical Company, which was noted in our issue of Sept. 16, is rapidly being brought into condition for service. The company is financed by Dr. F. S. Pearson, of New York, the head of the Mexican Light & Power Company. It is stated that the company will use the Héroult type of electric furnace for the manufacture of tool and drill steel, shoes and dies, forgings and steel castings. It will also make light steel rails from 14 lb. to 20 lb. to the foot. The rail plant will have a capacity of 20,000 tons per year to begin with, which will be increased as the demand requires. The capacity of the electrical steel furnaces will be from 16 tons to 20 tons of steel ingots per day. In connection with the steel plant there will be a large factory making calcium carbide. It is expected that this plant will have a capacity of from 3000 tons to 5000 tons per year. The electrical energy for the entire establishment will be furnished by the Mexican Light & Power Company and will be delivered at 20,000 volts.

CANADIAN GENERAL ELECTRIC WORKS.—The Mayor, Controllers, Aldermen and civic officials of Toronto, upon the invitation of the Canadian General Electric Com-

pany, recently paid a visit to that company's works at Peterboro. The party was welcomed by Mayor Rush and Hon. J. R. Stratton. After a visit to the $600,000 lift lock built by the Dominion Government, followed by dinner at the Oriental Hotel, the party to the number of 40 went to the electrical works, which occupy 75 acres, and comprise a dozen large buildings, each devoted to a separate branch of the industry. After inspecting the works, the party assembled at the Peterboro Club, where the visitors expressed their hearty thanks to the company for the pleasant and entertaining outing.

KITTERY WATER & LIGHT COMPANY.—Preparations are being made by the Kittery Water & Light Company, of Kittery, Maine, to furnish the city with energy for light and power. Current for the operation of the system will be secured from the plant of the Rockingham County Light & Power Company, at Portsmouth, N. H.; the latter company proposes to extend a cable across the river for this purpose. John S. Whittaker, general manager of the Rockingham company, is president of the Kittery company.

ELECTRICAL CONSTRUCTION.—Among the items printed under Construction Notes in our present issue are announcements of proposed new plants or considerable extensions to present plants at Augusta, Kan.; Mammoth Springs, Ark.; Canadian, Tex.; Grand Rapids, Mich.; Manchester, N. Y.; Crescent, Cal.; West Boylston, Mass.; Pitkin, Col.; Great Capacon, W. Va.; Fort Spring, W. Va.; Kittery, Maine; Fort Lupton, Col., and Reidsville, N. C.

EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON.—A proposition has been submitted to the Board of Control of Chelsea, Mass., by the Edison Illuminating Company, of Boston, to furnish energy for 418 incandescent lamps of 60 cp, to be operated 3828 hours per year, at $23.48 per lamp; the terms for three years are $22.77 and for five years are $22.31. The proposition has not yet been acted upon.

WEST VIRGINIA HYDROELECTRIC PLANT.—Plans are being developed by the Hydroelectric Development Company for the construction of a hydroelectric power plant at Edes Ford, West Va., on the Great Capacon River. A dam will be constructed which will furnish 100-ft. head. The equipment will include four vertical turbines direct connected to vertical generators.

LACLEDE GAS LIGHT COMPANY.—It is stated that the Laclede Gas Light Company, of St. Louis, is maturing plans for the erection of an electric plant to furnish energy to office buildings and industrial plants within a limited area. The company now purchases its electrical power from the Union Electric Light & Power Company.

NAVAL PROPOSALS.—The United States Navy Department, Washington, invites bids, to be opened Nov. 16, for various kinds of insulated wire and cables, and 2000 globes, type F.

Financial Intelligence.

THE WEEK IN WALL STREET.

During the past week the stock market has continued to recover from the forced selling made necessary by the advance in the rates for money. The discount rates of both the Bank of England and the Imperial Bank of Germany have not been increased during the week, and the reports of these institutions indicate that their cash reserves are increasing. The condition of the local banks is distinctly better, and consequently the alarm that was felt by traders is in a large measure removed. While the volume of trading has been restricted, when compared with that of a month ago, this has been mainly due to the fact that most of the small speculators have been placed in the conservative list by higher money. There is still a large demand for all good stocks for investment purposes, and there is still plenty of buying by holders who will be able to command money even when the rate goes up. The result of the week's trading has been substantial advances in almost every active issue. Amalgamated copper especially has been strong, owing to the rumors of a copper agreement and the hardening of copper prices.

During the week there has been very active trading in Interborough Metropolitan stock, and both common and preferred have shown some advances. This has given rise to many rumors to the effect that a new reorganization plan for the Metropolitan Street Railway interests has been prepared. It is also stated that the action of the Court of Appeals in overruling the Public Service Commissions' opposition upon the South Shore traction franchise has given hope to many interests connected with the surface properties in the city. The improved condition of the industrials and of the railroads is so marked, together with the record-breaking contracts for steel

NEW YORK.

	Oct. 25.	Oct. 30.	Shares sold.		Oct. 25.	Oct. 30.	Shares sold.
All.-Ch.	14½	15½	1,300	Int.-Met., pfd.	49¼	50⅜	69,870
All-Ch., pfd..	50⅛*	52½	3,200	Mackay Cos...	90¼*	91¼	1,500
Amal. Cop....	81¾	86¼	373,720	Mackay C., pd.	76*	75½	600
Am. D. T....	20½*	20½*	——	Man. Elev....	142*	142	1,125
Am. Loc.....	58¼	62	14,430	Met. St. Ry...	20*	24*	200
Am. Loc., pfd.	116*	116	600	N.Y.&N.J.Tel..	139¼	139¼*	——
Am. Tel. & C.	85*	85*	——	Steel, com....	89⅛	90⅛	1,328,850
Am. T. & T..	140¼	141¼	20,100	Stel, pfd.....	126¾	128	14,490
B. R. T.....	76¾	76	29,479	W. U. T.....	76½	77	2,585
Gen. Elec....	160½	164	3,600	West'h, com..	84½	87	3,600
Int.-Met., com.	17½	19¾	224,170	West'h, pfd...	140*	140*	——

PHILADELPHIA.

	Oct. 25.	Oct. 30.	Shares sold.		Oct. 25.	Oct. 30.	Shares sold.
Am. Rys.....	45¾	45½*	——	Phila. Elec....	13	13⅛	——
Elec. Co. of A.	12½	12½*	——	Phila. R. T....	25½	25¾	——
Elec. St. B'ty..	59	58*	——	Phila. Trac....	89½	89½*	——
E. S. B'ty, pfd.	30*	30*	——	Union Trac...	52	51¾	——

CHICAGO.

	Oct. 25.	Oct. 30.	Shares sold.		Oct. 25.	Oct. 30.	Shares sold.
Chi. City Ry..	180*	180*	——	Chi. Tel. Co...	136½	136½	——
Chi. Rs.,Ser.1..	108*	108*	——	Met. El. com.	17¾*	16½*	——
Chi. Rs.,Ser.2..	35½*	35½*	——	Met. El., pfd..	51*	51¾	——
Com. Edison...	119½	119¼	——	Nat'l Carbon..	98*	97	——
Chi. Subways..	7⅛	7*	——	Nat'l C., pfd...	120*	120*	——

BOSTON.

	Oct. 25.	Oct. 30.	Shares sold.		Oct. 25.	Oct. 30.	Shares sold.
Am. T. & T...	140¼	141½	——	Mex. Tel.....	3	3¼*	——
Cum. Tel.....	145*	147¼	——	Mex. Tel., pfd.	6	6*	——
Edison E. Ill..	252	252*	——	N. E. Tel.....	134½	135	——
Gen. Elec.....	160	163*	——	W. T. & T....	10*	10⅞*	——
Mass. E. Ry...	17	18½	——	W. T. & T., pfd.	88*	89*	——
Mass. E. R.,pfd.	80*	82	——				

*Last price quoted.
Shares sold are for week of Oct. 25 to Oct. 30.

products, that it would be hard to bring about anything more than a temporary reaction. Money on Oct. 30 was quoted at call, 4 per cent; 90 days, 5 @ 5½ per cent. The quotations in the table are those of the close, Oct. 30.

WASHINGTON, BALTIMORE & ANNAPOLIS.—The United States Court at Baltimore has appointed George T. Bishop, of Cleveland, and George Weems Williams, of Baltimore, receivers of the Washington, Baltimore & Annapolis Electric Railroad, running from Baltimore to Washington with a branch to Annapolis. Mr. Bishop has been president of the road and Mr. Williams counsel. The proceedings were brought by a stockholder and were not opposed by the company. Default on the bonds was made some time ago. Mr. Bishop issued a statement in which he said: "The receivership of the company was deemed necessary for the protection of the security-holders, when it became apparent that all of the reconstruction changes, made necessary by the adoption of the direct-current power system and the acquirement of new cars suitable for use in the streets of Washington, would not be completed, so as to enable the company to operate its cars in Washington by Nov. 15, as had been expected and relied upon by the company in making plans to care for its obligations. These changes cannot be completed before Feb. 15, 1910, owing to delays which the contractors were unable to foresee. A large portion of the cost of these changes has necessarily been paid by the company from its current earnings, necessitating a delay in the payment of pressing accounts, which would otherwise have been made from the earnings. We believe that the decreased operating expenses and increased earnings which will result from the improvements would have furnished sufficient funds to provide for the company's urgent and unusual requirements. Under the receivership, which will not be of long duration, all the reconstruction work can be continued, and the cost, which has not already been paid, can be provided for. A plan for the funding of the accrued and accruing interest and other indebtedness will be soon submitted to the security-holders, but it is the belief of the officers of the company that no drastic action will be necessary."

NEW YORK, NEW HAVEN & HARTFORD RAILROAD.—At the special meeting of the New York, New Haven & Hartford Railroad, Oct. 27, a new issue of $50,000,000 of capital stock was authorized, making the total capitalization of the company $171,000,000. This new stock will be sold to the present shareholders at $125 per share, payable in four installments at intervals of six months. It was explained at the meeting that the greater portion of this new money was to be

expended upon the complete electrification of the line from New York to Boston, and immediate work will be done on the branch between Stamford and New Haven. The road expects to operate both its passenger and freight service by electricity. There are also some plans being considered which will give the company an independent entrance into Manhattan, and bring it into connection with the Pennsylvania tunnel at Thirty-third Street. In explaining an item of loss in the report amounting to $453,000, President Mellen said that when the company was forced by the laws of Massachusetts to dispose of the Worcester & Webster Trolley Company and the Webster & Dudley line, these properties at forced sale brought that much less money than they originally cost the New Haven Company.

WATERTOWN (S. D.) LIGHT & POWER COMPANY.—The Watertown Light & Power Company, controlled by the Ferris Brothers System, has purchased the property of the Kirlin-Gray Electric Company, of Watertown. It is the intention of the company to build an entirely new station, and install 60-cycle, three-phase equipment. The Ferris Brothers now control and operate the Eldora (Ia.) Electric Light Company, Osage (Ia.) Electric Light, Heat & Power Company, Yankton (S. D.) Light, Heat & Power Company, Union City (Ind.) Lighting Company, Franklin (Ind.) Water, Light & Power Company, and Watertown (S. D.) Light & Power Company.

KINGS COUNTY ELECTRIC LIGHT & POWER COMPANY.—A petition has been filed with the Public Service Commission by the Kings County Electric Light & Power Company, asking approval of a $5,000,000 bond issue. These are to be convertible 6 per cent debenture bonds, payable in 12 years, and convertible into stock at par at any time after three years. The purpose of the issue is to pay for construction and extension of plant and distributing system, and for the acquisition of other properties. The Edison Electric Illuminating Company, of Brooklyn, the entire stock of which is held by the Kings County Company, joins in the petition.

CONTINENTAL TELEPHONE & TELEGRAPH COMPANY.—It is now made known that the $50,000,000 Continental Telephone & Telegraph Company, which was organized recently under the laws of New Jersey and are referred to in our issue of Oct. 14, contemplates the absorption and merging of all of the principal long-distance Independent telephone interests between the Atlantic Ocean and the Rocky Mountains. The company, according to the statements given out by its organizers, will be the successor of the National Long Distance Telephone Syndicate, which for a year or more has been operating under the management of John A. Howard, of Wheeling, West Va., and Max Koehler and Herman C. Stifel, of St. Louis. The company has already taken over the property of the Independent Union Telephone & Telegraph Company. It is said that it is backed by both European and domestic capital. The organization is committed to an expenditure of about $20,000,000 in the next two years for the construction of a comprehensive system of lines reaching from the middle West and as far as the Rocky Mountains. The Independent Union, the first property acquired, operates from Newburgh, N. Y., to Erie, Pa., and takes in Albany, Troy, Schenectady and many other up-State towns. It is stated that the Continental Company has already started building east and west out of Buffalo with heavy copper lines for through business, and that contracts have been let for many other extensions. It is promised that when the system is completed it will connect 2,986,515 independent telephones with a national long distance service.

TOLEDO RAILWAYS & LIGHT COMPANY.—The earnings of the Toledo Railways & Light Company continue to run along with a slight increase over previous years, but it has become evident that any definite increase in the company's business is dependent upon an increase in mileage rather than upon the development of the city. The gross earnings for August were larger than for the same month in any previous year, but the surplus after charges for the month was but $32,614, as compared with $26,704 for the last year. The protective committee, which now has the property in charge, has petitioned that no receiver is necessary, and that the difficulties of the company will be finally cleared away and a permanent scheme of refinancing agreed upon. The entire matter is dependent largely upon the execution of a new franchise. Uncertainty with regard to this has been the main cause for the difficulty of refinancing.

GENERAL MOTORS COMPANY.—The holders of the common stock of the General Motors Company, of which there is now $5,500,000 outstanding, will receive on Nov. 15 additional common shares at the rate of 1½ for every one now held. This is a stock dividend of 150 per cent, and it will be paid out of the increase of $34,500,000 recently made in the common stock. The preferred shares have received 7 per cent ever since the company's organization a few years ago, but the common has as yet received no cash dividends, the company's policy having been to put all of its excess earnings back into the business. The General Motors Company owns or controls 13 of the largest manufacturing concerns of automobiles and motor cars. At the annual meeting held Oct. 29, W. A. Eaton was re-elected president, and W. C. Durant, chairman of the executive committee.

ELWELL PARKER ELECTRIC COMPANY.—The Anderson Carriage Company, of Detroit, has purchased the Elwell Parker Electric Company, of Cleveland, which has made a specialty of the manufacture of electric automobile motors. The company was capitalized for $400,000, and employed several hundred men. The works will continue to be operated in Cleveland. With this acquisition the Anderson Carriage Company will be manufacturing practically every part of its electric vehicles except the wheels and tires. The company recently increased its capital stock to $1,000,000.

ANDROSCOGGIN RESERVOIR COMPANY.—The Androscoggin Reservoir Company, of which A. N. Burbank, of the International Paper Company, is president, is rushing work on what will be one of the largest artificial lakes in the world, located at Aziscoos Falls, Me. The reservoir will be 12 miles long, and will contain 8,000,000 cu. ft. of water. The present available water-power of the Androscoggin River has been practically exhausted, and the creation of this new lake is designed to furnish additional power for the varied industries located along the river. Over $300,000 of the cost of developing this new reservoir has been contributed by the corporations interested in the use of power along the river.

OLD COLONY STREET RAILWAY.—The Railway Commissioners of Massachusetts are considering an application of the Old Colony Street Railway Company for an issue of 12,000 shares of additional capital stock, to be issued to shareholders at 195 per share. The proceeds of this issue are to be applied to the payment of $1,912,000 5 per cent bonds of the Clinton, Fitchburg & New Bedford Railway, which will mature Jan. 1, 1910. Any of these new shares which are not subscribed for by present stockholders will be sold at public auction, subject to the order of the commissioners. There is practically no opposition to this request.

WESTERN UNITED GAS & ELECTRIC COMPANY.—The Western United Gas & Electric Company, which was formed in 1905 as a consolidation of the Fox River Light, Heat & Power Company, of Aurora, Ill., the Joliet Gas Light Company, the La Grange Gas Company and the Elgin American Gas Company, has enjoyed a remarkable financial growth and is rapidly increasing its business. For the year which ended July 31, 1909, the gross earnings of the company were $823,755, an increase of 40.4 per cent over the earnings for the same period in 1906.

CONSOLIDATED GAS COMPANY.—An abstract of the report of the Consolidated Gas Company, and its subsidiary gas companies, for the year ended Dec. 31, 1908, has been given out by the Public Service Commission. The gross revenues from the company's business were $12,000,689, and from rentals and dividends on stocks owned, $5,939,404. After paying expenses, taxes and dividends, there was a surplus left of $3,045,174. The total assets of the company, according to the balance sheet, were $149,544,169.

KENTUCKY TELEPHONE DEAL.—The Louisville Home Telephone Company has negotiated to take over the bonds of the Independent Long Distance Telephone. These bonds were purchased from a bondholders' committee, which took charge of the company when it recently got into financial difficulties. There were in the hands of this committee between $450,000 and $470,000 of bonds, and the cash which figures in the present transaction will probably amount to $250,000.

CUTHERT (GA.) ELECTRIC LIGHT & WATER PLANT.—The City of Cuthert, Ga., has voted $20,000 of new bonds, the proceeds of which will be used for improvements upon the municipal electric light and water works. The work will be started as soon as the bonds are sold.

NORTHWESTERN ELEVATED'S ANNUAL REPORT.—In his annual report, made public Oct. 25, President M. B. Starring, of the Northwestern Elevated Railroad Company, of Chicago, reported net earnings for the year ended June 30 equal to a trifle over 7 per cent on the $5,000,000 preferred stock. The payment of dividends at the rate of 4 per cent was begun. The daily average passenger traffic for the year was 112,207, an increase of 9.75 per cent. The traffic of the road has shown a constant increase since 1901, when the daily average was 51,918. The gross earnings for the year were $2,540,083, an increase of 3.15 per cent over the preceding year. The net earnings were $1,545,064. The ratio of operating expenses to earnings (excluding the net earnings of the Union Loop) was 68.24 in 1909 and 66.44 in 1908. An interesting reference was made by Mr. Starring in respect to the rehabilitation of the surface lines on the Northwestern Elevated. He said: "The rehabilitation of the lines of the surface railways and the improvements in their rolling stock and schedules somewhat affected this company's gross earnings, not only upon its own lines, but by reason of the effect upon the revenue of the other Loop lessees, correspondingly affecting the revenue from the Loop. The most serious effects have now been felt, and the business of the elevated railways in its entirety is improving."

CENTRAL & SOUTH AMERICAN TELEGRAPH COMPANY.—It is said that the Central & South American Telegraph Company will shortly issue to its stockholders a 20 per cent stock dividend. This distribution represents the expenditure which the company made several years ago in the construction of a cable from New York to Colon via Cuba. This work was done in connection with the Mexican Telegraph Company.

ST. JOSEPH LONG-DISTANCE TELEPHONE COMPANY.—A new incorporation has been made in Missouri, known as the St. Joseph Long-Distance Telephone Company, with a capital stock of $1,250,000, of which $125,000 is common and has the voting power. The company proposes to absorb a large number of Independent telephone systems in northern Missouri and combine them into one system. The incorporators are men who have been identified with the Independent telephone business in that section for a number of years.

THIRD AVENUE RAILROAD EARNINGS.—The report of the Third Avenue Railroad Company, made to the Public Service Commission for the year ended June 30, 1909, showed a surplus on the entire stock, after the payment of operating expenses, taxes and of the $769,157 interest charges still in force, of $1,265,132. These figures do not account for the rental on the Third Avenue stock or the interest on the $37,560,000 of general mortgage bonds which are in default.

BITTER ROOT (MONT.) TELEPHONE COMPANY.—The plant and holdings of the Bitter Root (Mont.) Telephone Company have been purchased by the Montana Independent Telephone Company. The line of the Bitter Root company was 26 miles long, extending from Corvallis to Darby. It is stated that this line will be extended north through Victor to Florence, where it will connect with the main line running from Missoula.

YONKERS RAILROAD COMPANY.—The report of the operations for the year ended June 30, 1909, of the Yonkers Railroad Company shows a gross revenue of $487,552, and operating expenses of $489,241; adding in the taxes and the fixed charges the net deficit is $79,668. The total deficit on the company's books on the date mentioned was $440,764.

QUEBEC UTILITIES MERGER.—It is said that all the details for the managing of the street railway, electric light and power companies of Quebec have been concluded after negotiations which have lasted for several weeks. The capital of the united company will be $12,000,000 common stock, and $10,000,000 bonds.

BRASE ELECTRIC COMPANY, BALTIMORE.—An application has been made to the Circuit Court in Baltimore for the appointment of a receiver for the Brase Electric Company. The bill was filed by Claude E. Brasefield, the largest stockholder, who declares that the company owes him for salary and is insolvent.

DIVIDENDS.

Connecticut Railway & Lighting Company, quarterly, preferred, 1 per cent; common 1 per cent, both payable Nov. 15.

Electric Properties Company, preferred, quarterly, 1½ per cent, payable Nov. 10.

Ohio Traction Company, preferred, quarterly, 1¼ per cent; common, initial, 1 per cent, payable Nov. 1.

Pacific Gas & Electric Company, preferred, 1½ per cent, payable Nov. 15.

REPORTS OF EARNINGS.

	Gross earnings.	Expenses.	Net earnings.	Changes.	Surplus.
American Cities Railway & Light Company—Operating Companies:					
September, 1909	$488,795	$287,470	$201,324	$106,724	$94,601
September, 1908	458,218	276,210	182,007	105,456	76,551
Binghamton (N. Y.) Railway Company:					
Quarter ended June 30, 1909	84,837	55,898	28,939	23,040	5,899
Quarter ended June 30, 1908	80,255	46,944	33,311	23,396	9,914
Birmingham (Ala.) Railway, Light & Power Company:					
September, 1909	188,364	105,753	82,611	.....	.....
September, 1908	177,388	107,566	69,822	.....	.....
Detroit United Railroad Company:					
September, 1909	751,818	477,850	273,968	158,124	127,606
September, 1908	668,489	423,136	245,353	135,049	115,332
Fairmont & Clarksburg Traction Company:					
September, 1909	43,674	15,094	28,580	10,416	19,947
September, 1908	39,741	12,469	27,272	10,416	17,121
Jamestown (N. Y.) Street Railway Company:					
Quarter ended June 30, 1909	52,194	28,503	23,690	15,956	6,280
Quarter ended June 30, 1908	45,589	28,939	16,650	14,729	517
Lake Shore Electric Railway Company:					
September, 1909	108,206	49,842	58,364	34,804	23,560
September, 1908	104,072	49,648	54,424	34,012	20,412
Manufacturers' Light & Heat Company, Pittsburgh:					
Nine months ended Sept. 30, 1909	3,864,290	1,523,179	2,341,111	783,654	1,557,456
Nine months ended Sept. 30, 1908	3,382,783	1,414,746	1,968,037	679,760	1,288,277
Massachusetts Electric Companies:					
Quarter ended Sept. 30, 1909	2,626,388	1,289,727	1,336,661	432,058	904,603
Quarter ended Sept. 30, 1908	2,483,710	1,341,817	1,141,893	417,493	724,400
Northwestern Elevated Railroad Company, Chicago:					
Year ended June 30, 1909	2,540,883	995,818	1,545,064	1,189,288	355,776
Year ended June 30, 1908	2,463,188	965,118	1,498,070	1,147,183	350,889
Pacific Telephone & Telegraph Company:					
Nine months ended Sept. 30, 1909	9,002,289	6,293,153	2,709,136	946,920	1,762,216
Nine months ended Sept. 30, 1908	7,738,528	5,727,001	2,011,527	747,742	1,256,785
Syracuse & Suburban Railroad Company:					
Quarter ended June 30, 1909	30,599	24,062	6,536	7,235	*614
Quarter ended June 30, 1908	30,209	14,964	15,244	7,309	8,341
Toledo Railways & Light Company:					
September, 1909	217,737	121,779	95,958	75,483	20,833
September, 1908	222,892	111,900	110,992	71,976	39,077
Toronto Railway Company:					
September, 1909	379,981	180,835	199,146	.....	.....
September, 1908	354,095	160,942	193,153	.....	.....
Tri-City Railway & Light Company:					
Quarter ended Sept. 30, 1909	506,987	279,364	227,623	130,191	97,432
Quarter ended Sept. 30, 1908	450,172	244,722	205,450	122,789	82,661
Twin City Rapid Transit Company:					
September, 1909	645,197	270,035	375,162	140,250	234,912
September, 1908	583,876	276,588	307,288	138,666	168,622
United Railways, San Francisco:					
August, 1909	642,120	363,952	278,168	.....	.....
August, 1908	587,733	356,028	231,705	.....	.....

*Deficit.

GENERAL NEWS

Construction News.

KINGMAN, ARIZ.—Preparations are being made by the Frisno Mines Power Company, operating near Kingman, to install an electric power plant on its property.

BONO, ARK.—The Farmers' Mutual Telephone Company is planning to extend its telephone line from Cash to Jonesboro, and to connect with the Lorado system at the county line between Craighead and Greene counties.

HARRISBURG, ARK.—The Going Telephone Company, of Harrisburg, Ark., has purchased the Sarle exchange, for $22,500. The company is operating in Harrisburg, Vanndale, Wynne, Earle, Crawfordsville and Marion.

JONESBORO, ARK.—Application has been made to the City Council by Preston Hatches, of the Home Telephone Company, representing a number of capitalists, for a franchise to construct a street railway in Jonesboro with interurban connection to Nettleton, three miles distant.

LITTLE ROCK, ARK.—Acting Mayor Tuohey, in a message to the City Council, has recommended that the city erect buildings for the municipal electric light plant, and to serve as an engine house and stable for horses belonging to the street and police departments on property owned by the city near the city hall. He also recommended that the proposed electric light plant should provide for 1000 lamps so as to meet demands for the future. There are now in service 370 lamps. The lease on the buildings now occupied by the above departments will expire February, 1910. The cost of the proposed buildings is estimated at $45,000.

MAMMOTH SPRINGS, ARK.—Work has commenced on the construction of the dam across Spring River in connection with the new electric power plant to be erected by Napoleon Hill, of Memphis, Tenn., at a cost of about $300,000. The proposed plant will furnish electricity to all towns on the 'Frisco railroad as far west as West Plains, Mo., and Jonesboro, Ark. The company also contemplates building electric railways to connect many inland towns.

PINE BLUFF, ARK.—The Moscow & Youngstown Telephone Company, recently organized, proposes to erect a telephone line to connect Moscow, Garretson and Youngstown; long distance connection will also be provided for. P. C. Galloway is president of the company and E. Young treasurer and manager.

BURBANK, CAL.—L. C. Brand has submitted a proposition to the citizens of Burbank offering to construct an electric railway from Burbank to Glendale, provided a bonus of $40,000 and the right of way along the route is given.

CRESCENT, CAL.—The Smith River Electric Company is contemplating the construction of a large hydroelectric power plant on Smith River about ten miles from Crescent City, work on which will probably commence within 90 days. It is estimated that 3250 hp can be developed. The present plans of the company include, beside the construction of the above plant, two other plants located at points along the north fork and middle forks of the river, and the erection of transmission lines which will extend through Del Norte and Humboldt counties, and a portion of Josephine County, Ore. It is also planned to duplicate the system and furnish a 24-hour service.

FRESNO, CAL.—Contracts have been awarded by the San Joaquin Light & Power Company for equipment for its power plant as follows: To the General Electric Company, Schnectady, N. Y., for generators with a total rating of 8000 kw; also 8000 kw in transformers with necessary switchboards and exciters; about 4000 ft. pressure pipe line to the Pelton Water Wheel Company, of San Francisco, Cal., and to the Abner Doble Company, of San Francisco, Cal., for water wheels. J. G. White & Company, of New York, N. Y., are designing and supervising engineers. A. G. Wishton is general manager.

MARYSVILLE, CAL.—Preparations are being made by the Northern Electric Company for extension of its valley lines during the coming year. The first extension will run from Marysville to Colusa.

NAPA, CAL.—Preparations are being made by the Napa Valley Electric Company to erect a transmission system to furnish electricity for lamps and motors in Napa County. The company has purchased franchises and contracts of the Snow Mountain Power Company in Napa, St. Helena and Calistoga. It is expected to have the system completed within 30 days. It is said the Napa company will distribute electricity generated by the Snow Mountain company. Henry Brown, of Napa, is one of the directors of the Napa Valley Electric Company.

DENVER, COL.—Negotiations have been closed between the Central Colorado Power Company and the Northern Colorado Power Company, whereby the last named company will secure electricity from the large hydroelectric power plant now being constructed by the Central Colorado Power Company in Boulder Canon. The Northern Colorado Power Company has a large steam plant at Lafayette, which furnishes electrical service throughout the northern part of the State. The demands for electricity already have reached the output of the plant, and plans are under way to double the size of the plant.

FORT LUPTON, COL.—The Lupton Utility Company is making preparations to begin work on the installation of an electric light plant and water works system in Fort Lupton. Contract has been awarded for the construction of the power house.

PITKIN, COL.—Preparations are being made by A. E. Reynolds, of Pitkin, Col., for the construction of an electric power plant to furnish electricity to operate the mining properties in this vicinity in which he is interested. A hydraulic turbine and generator will be purchased soon.

BRIDGEPORT, CONN.—The United Illuminating Company has submitted a proposition to reduce the price on arc lighting in the city by $5.47 per lamp, pending an investigation. This reduction would mean a saving of over $3,500 a year to the city. Under the terms offered the rate per arc lamp per year is reduced to $73, but no concessions are offered to private consumers.

NORWICH, CONN.—The Board of Electric and Gas Commissioners has announced a reduction in the price of electricity for lamps and motors as follows: For 1 to 450 kw, 10 cents per kw-hour; over 450 kw. 10 cents for the first 450 kw and 5 cents for each additional kw-hour. For motors from 1 to 500 kw, 5 cents per kw-hour; over 500 kw, 5 cents for the first 500 kw and 2 cents for each kw-hour additional. The city purchases electricity for operating the municipal electric plant from the Uncas Power Company for 1 cent per kw-hour. A profit was made in the electrical department in 1908 of $15,367, the total amount of sales being $82,819.

HASTINGS, FLA.—The Tennessee Cooperage Company is reported to be interested in the establishment of an electric light plant.

CUTHBERT, GA.—L. L. Martin, city clerk, writes that the city will make improvements to the electric light and water plants, which will involve an expenditure of about $20,000, as soon as the city sells the bonds which were authorized at an election held recently.

HAWKINSVILLE, GA.—Contracts have been awarded by the city for equipment for the municipal electric light plant as follows: To J. S. Schofield Sons Company, of Macon, Ga., for a 150-hp high pressure boiler at $970; for Corliss engine with generator direct connected to the Wisconsin Engine Company, of Corliss, Wis., at $2,865, and the Westinghouse Electric & Manufacturing Company, of Pittsburgh, Pa., for generator, switchboard, arc and tungsten lamp-system, for $5,112. The total cost of the plant is estimated at $15,500.

SANDPOINT, IDAHO.—Preparations are being made by the Northern Idaho & Montana Power Company for the construction of a large power plant, work on which will commence within 30 days. The new plant will have an output of 1500 hp and will cost about $100,000. The company has awarded the contract for the construction of its substation in Newport, Wash., to Samuel Anderson, of Spokane, Wash. The cost of building and equipment is estimated at $15,000. J. G. Jones is manager.

PEORIA, ILL.—The Peoria Railway Terminal Company contemplates placing contracts for two generators, two turbines and other equipment within the next three months.

WAUKEGAN, ILL.—An addition is being erected to the plant of Wilder Brothers' Tanning Company in Waukegan, which will be equipped with a blower system and from 10 to 15 electric motors and freight elevator will be installed.

ANDERSON, IND.—It is reported that the American Steel & Wire Company contemplates enlarging its mills in Anderson. The plant, it is said, will be equipped for electric motor drive.

ELWOOD, IND.—Arrangements are being made by the Elwood Electric Light Company to extend its transmission lines to Frankton, Ind., four miles distant, to furnish electricity in that town.

ELKHART, IND.—The Brunswick-Balke-Collender Company, of Chicago, Ill., has purchased the Kimbark factory building in Elkhart, Ind., and will equip the factory for electric motor drive throughout. When completed the business will be moved from Chicago to Elkhart.

FORT WAYNE, IND.—The Board of Public Works has awarded the contract for the installation of two new switchboards, an oil filter and other electrical equipment for the municipal electric light plant to the Fort Wayne Electric Works for $1,225. The city is also considering the purchase of an additional boiler for the plant.

FT. WAYNE, IND.—The Board of Public Work has notified the Ft. Wayne & Wabash Valley Traction Company that the new cement poles erected by the company in the city for tests purposes have been found satisfactory. The traction company, it is said, will now proceed with the manufacture of cement poles to replace the present poles in Fort Wayne and ultimately on other portions of the railway.

GARFIELD (P. O. DARLINGTON), IND.—The Garfield telephone exchange has been purchased by the Home Telephone Company, which proposes to erect two new toll lines to Garfield, one of which will be extended to Darlington.

KENDALLVILLE, IND.—The Flint & Walling Manufacturing Company is constructing a new plant, the equipment of which will include an Allis-Chalmers cross compound Corliss engine direct-connected to generator, a 750-hp Babcock & Wilcox boiler, water purifying plant, heaters and other equipment.

LAFAYETTE, IND.—The Indiana Electric Transmission Company has filed a notice with the Secretary of State announcing that the company has changed its headquarters from Lafayette to Terre Haute, Ind. The company is said to be considering a bond issue to finance its undertaking. H. S. Hyatt is secretary.

MONTICELLO, IND.—The Town Board has granted the Northwestern Indiana Traction Company a 75-year franchise to construct an electric railway the entire length of Main and Marion streets. The company claims to have secured the entire right of way for its proposed railway from Hammond to Dyer.

NEW ALBANY, IND.—It is reported that the Robison & Norton Company is contemplating rebuilding its factory recently destroyed by fire. The original plant was operated by electricity and the new plant will be equipped for electric motor drive throughout.

SEYMOUR, IND.—The contract for street lights will expire in a few days, and unless the city and the receiver for the Seymour Electric Light Company can get together on a new contract that the court will approve, the streets of the cilty will be in darkness. The city granted a franchise last March to the Indiana Public Utilities Company, represented by W. B. Holton, of Indianapolis, to construct and operate a light plant in the city. Although the plant was to have been completed by Oct. 1, nothing has yet been done. The City Council voted to extend the time until next July, and in the meantime the city will be without light unless the old company furnishes it.

SOUTH BEND, IND.—The City Council has passed an ordinance requiring the Bell Telephone Company and allied companies to place their wires underground.

WATERLOO, IND.—The Home Telephone Company, which has been instructed by the City Council to remove all its poles and wires from the business section of the city, announces that it will erect new wires and poles to be set in alleys; other improvements will also be made to its system.

ATLANTIC, IA.—The Atlantic Northern & Southern Railway Company, of Atlantic, Ia., is making preparations for the construction of its proposed electric railway, 58 miles in length, and is in the market for material for the same. Rattenborg, Ross & Judd, of Atlantic, Ia., engineers, will purchase the material.

DES MOINES, IA.—Plans are being considered by the Mississippi Telephone Company for improvements to its system in Southeastern Iowa, which will involve an expenditure of $10,000.

GRINNELL, IA.—The Grinnell Electric & Heating Company is contemplating the installation of 150 100-watt tungsten lamps.

LAURENS, IA.—The question of establishing an electric light plant in Laurens, is under consideration.

MARSHALLTOWN, IA.—The business men of Marshalltown are interested in a project to build an interurban railway from Marshalltown to Grundy Center, and eventually to New Hartford, Clarksville, Greene and Charles City. It is estimated that the railway could be built for $360,000.

ASHLAND, KAN.—The citizens are reported to have voted to issue $30,000 in bonds, of which the proceeds of $20,000 will be used to erect a water works system and $10,000 for an electric light plant.

AUGUSTA, KAN.—The City Council is considering a proposition submited by S. J. Stafford for the construction of an electric light plant in Augusta, under the terms of which the city is to grant a 50-year franchise and assist in the construction of a dam across the Walnut River. The city will soon take steps to secure estimates of the cost of construction of the dam.

IOLA, KAN.—The Iola Engineering Company is reported to be preparing plans for an electric light plant in Iola.

PINEVILLE, LA.—The Town Council has authorized Mayor Watkins to appoint a committee to investigate the question of lighting the town by electricity.

BANGOR, MAINE.—Work has commenced on the construction of a large reservoir to be located at Aziscoos Falls, Maine, by the Androscoggin Reservoir Company. The new lake will be about 12 miles long and will furnish additional power to the industries located along the river. A. N. Burbank, president of the International Paper Company, is president of the Androscoggin Power Company.

KITTERY, MAINE.—The Kittery Water & Light Company, recently incorporated, is making preparations to furnish the city with electricity for street lighting and interior service before the winter is over. Electrical energy for operating the system will be secured from the plant of the Rockingham County Light & Power Company, of Portsmouth, N. H. The last-named company proposes to extend a cable across the river to carry the transmission line from its plant in Portsmouth to Kittery. John S. Whittaker, general manager of the Rockingham County Light & Power Company, is president of the Kittery Water & Light Company.

SANFORD, MAINE.—Surveys have been completed for the transmission line of the Sanford Electric & Power Company from Sanford to West Buxton. The company will furnish electricity for operating the Goodall mills. The contract calls for the completion of the line within 90 days.

ATHOL, MASS.—The State Board of Gas and Electric Light Commissioners has granted the Athol Gas & Electric Company permission to issue 1718 shares of capital stock at $100 per share.

CHELSEA, MASS.—The Edison Electric Illuminating Company has submitted a bid to the Board of Control for lighting the streets of the city as follows: For furnishing electricity for 418 incandescent lamps of 60 cp to be operated 3828 hours per year—one year, $23.48 per lamp; three years, $22.77; five years, $22.31, and for ten years, $21.13 per lamp per year.

COHASSET, MASS.—Preparations are being made for the erection of a high-tension transmission line from the central power plant in East Bridgewater to the substation in Cohasset to supply electricity in this town. The property of the Cohasset Electric Light & Power Company, of Cohasset, was recently purchased by the Stone & Webster, of Boston, Mass. The contract for the erection of the poles has already been awarded.

LEOMINSTER, MASS.—Cluett, Peabody & Company, of Leominster, Mass., have decided to install a power plant to furnish electricity for operating their factory. The company has been negotiating with the Connecticut River Power Company to furnish electrical energy, but decided it could generate its power cheaper than it can be purchased. The company will also change its lighting system, installing tungsten lamps in place of the incandescent lamps now in use.

UXBRIDGE, MASS.—The Uxbridge Worsted Company has recently installed a 100-kw generator in its mill to furnish electricity to operate the machinery. The company has until recently purchased electricity from the Uxbridge & Northbridge Company to operate its plant.

WESTFIELD, MASS.—The municipal electric light department has decided to furnish electricity for heating residences and offices in Westfield.

WEST BOYLSTON, MASS.—At a special town meeting held Oct. 18 the citizens voted to establish a municipal electric lighting and power plant to furnish electricity for lighting the streets and residences of the town. Electricity for operating the system will be obtained from the transmission line of the Connecticut River Transmission Company. The cost of the proposed plant is estimated at $15,000.

WORCESTER, MASS.—The Worcester Electric Light Company has purchased the property of the Curtis Manufacturing Company, on Webster Street, with Curtis pond rights. The company proposes to erect a new plant on the site. George T. Dewey, counsel for the company, states that the new plant with equipment, etc., will involve an expenditure of from $300,000 to $400,000.

DETROIT, MICH.—The Reinforced Concrete Pipe Company, of Jackson, Mich., is reported to be erecting a new plant in Detroit for the manufacture of forms, molds and machinery to make reinforced concrete pipe. The building will be equipped throughout for electric motor drive; an electric traveling crane and considerable wood-working machinery will be installed.

GRAND RAPIDS, MICH.—Bids will be received at the office of the Board of Public Works, Grand Rapids, Mich., until Nov. 18 for furnishing and erecting two water tube boilers, or two internally fired boilers with Morrison corrugated furnaces having a rating of from 350 to 375 hp each, to be installed at the combination pumping and lighting station in the city of Grand Rapids, Mich., in accordance with plans and specifications on file at the office of the board. All proposals must be made upon blanks that will be furnished upon application to the board. William M. Gormley is president of the board.

MENOMINEE, MICH.—The Menominee & Marinette Light & Traction Company has commenced work on the construction of a substation for its new power plant, which will be located in the rear of its present station on Parmenter Street. Electricity will be transmitted from the power plant at Grand Rapids, to the substation for distribution in Menominee and Marinette. The plant at Grand Rapids will have an output of 7500 hp.

SAGINAW, MICH.—The Chippewa River Power Company has applied to the City Council for a franchise to furnish electricity in Saginaw. The company proposes to develop the water power of Chippewa River in Isabella and Midland counties to generate electricity for transmission to the Saginaw Valley to be utilized for heat, lamps and motors.

STURGIS, MICH.—The citizens have voted to issue $175,000 in bonds, the proceeds to be used to acquire and develop the Leland water power on St. Joseph River, 18 miles from Sturgis, to supply electricity for the municipal electric light and water plants and 1000 hp for manufacturing purposes.

CHISHOLM, MINN.—The Range Power Company is constructing a new power plant which will be completed early in December. When completed a 24-hour service will be established. The new plant will have an output of 550 hp. A new 50-arc lamp rectifier will be installed.

FERGUS FALLS, MINN.—The Otter Tail Power Company is reported to have submitted a proposition to the city offering to supply electricity to operate the electric light plant for a term of ten years at 2½ cents per kw-hour for the first 200,000 kw, and 2¼ cents for the second 200,000 kw, delivered at the city switchboard, on the condition the city will not furnish electricity for power purposes for ten years.

LINDSTROM, MINN.—It is reported that an electric light plant will soon be installed in Lindstrom.

McKINLEY, MINN.—Fairbanks, Morse & Company have been awarded the contract for generator for the municipal electric light plant, for $1,297. Howard W. Irwin, superintendent of the Eveleth Electric Company, will have charge of the construction of the system.

SAUK CENTER, MINN.—It is reported that the Keller Manufacturing Company, of Sauk Center, is planning to rebuild its plant, which was recently destroyed by fire. The company will soon be in the market for equipment for the plant including boilers, engine, generator and other apparatus.

SEBEKA, MINN.—The construction of an electric lighting system in Sebeka is under consideration. John Konkler is interested in the project.

VIRGINIA, MINN.—V. M. Prindle, of Duluth, Minn., and W. D. Chapman, of Chicago, Ill., have applied to the City Council for a franchise to operate an electric street railway within the city limits. The promoters propose to construct a railway to connect with a line from Virginia to Eveleth, thence to Gilbert and from there to Virginia, which later will be extended to Hibbing and other range points.

MISSOULA, MONT.—The plant and holdings of the Bitter Root Telephone Company have been purchased by the Montana Independent Telephone Company. The telephone line of the Bitter Root Company is 26 miles long and extends from Corvallis to Darby, which will be extended north through Victor to Florence, where it will connect with the main line running from Missoula to Darby. T. S. Lane is manager of the Montana Independent Telephone Company.

AURORA, MO.—The City Council has granted the Springfield Gas & Electric Company, of Springfield, Mo., a franchise to establish a gas and electric plant in Aurora.

CHILLICOTHE, MO.—At a recent election the citizens defeated the proposition to issue $150,000 in bonds to establish a municipal electric light plant and water works system.

ST. LOUIS, MO.—The Laclede Gas Light Company is reported to be contemplating the erection of an electric plant to furnish electricity to office buildings and industrial plants for lamps and motors. The company now purchases electrical power from the Union Electric Light & Power Company, of St. Louis, Mo.

TRENTON, MO.—Preparations are being made by the Trenton Telephone Company for the erection of a metallic telephone line from Grundy to Princeton. Claud J. Bain is manager.

AURORA, NEB.—The Aurora Electric Light Company has petitioned the State Railway Commission for permission to issue $28,000 in bonds. The company contemplates the construction of a central heating plant.

HARVARD, NEB.—The Harvard Electric Company has applied to the State Railway Commission for permission to issue $12,000 in bonds, the proceeds to be used to construct an electric light plant in Harvard. The city at present has no electric system, but has made all necessary contracts for construction of the plant.

HOLDREDGE, NEB.—The City Council is contemplating extending the street lighting service in the residential section of the city.

LINCOLN, NEB.—The City Council has appointed a committee to investigate the municipal electric light plant in regard to increasing the efficiency of the plant, and the cost of the same, and report to the Council.

OMAHA, NEB.—Plans are being prepared by the Omaha & Council Bluffs Street Railway Company for the construction of a new power plant, which, with equipment, will cost about $1,000,000. It is estimated that it will require about three years to build the plant, but part of the plant will be ready for use within 12 months after work is started. When the plant is completed the company will equip its railway with large double-truck cars; the company also contemplates making extension to its railway lines. The new plant will be located at the foot of Jones Street directly across from the present power house. G. W. Wattles, of Omaha, Neb., is president of the company.

RENO, NEV.—Work has commenced on the construction of an electric line into the southeast end of the city, which will run on South Virginia and Moran Streets and Wheeler Avenue. Charles Burke and S. H. Wheeler are interested in the project.

HOBOKEN, N. J.—The Common Council has decided to reject all bids heretofore submitted for lighting the streets and public places in the City of Hoboken, and has authorized the city clerk to readvertise for bids for lighting the streets, roads and public places, in accordance with specifications now on file with the city clerk.

NEWARK, N. J.—Arrangements are being made by the Atha Steel Casting Company, of Newark, N. J., for the construction of an addition to its plant on Chapel Street and Lister Avenue, which will be equipped with electric hoists and traveling cranes.

AZTEC, N. M.—The Aztec Light & Power Company, it is said, will purchase equipment for a power plant and electrical transmission during the coming winter.

LAS CRUCES, N. M.—Plans are being made by the Texas, New Mexico & Pacific Railroad Company for the construction of its railway from Las Cruces to Sunny Slope, three miles in length, work on which will begin in about two months. The power station and repair shops will be located in Sunny Slope. James T. Smith is president and treasurer.

ALBION, N. Y.—The Public Service Commission has authorized the A. L. Swett Electric Light & Power Company to execute a mortgage on the property of the Albion Power Company to secure an issue in bonds amounting to $74,500. The Swett company recently acquired the property of the Albion company at a foreclosure sale.

BAY SHORE, N. Y.—The Board of Trade has adopted a resolution favoring the installation of a municipal electric light plant and water works system.

BINGHAMTON, N. Y.—The Binghamton Railway Company has commenced work on the extension of its State Street power plant to make room for additional equipment and the construction of a new smokestack, which will involve an expenditure of about $40,000.

BROOKLYN, N. Y.—The Public Service Commission, First District, has notified the contractors who have been awarded contracts for the construction of the Fourth Avenue subway in Brooklyn to prepare to execute their contracts at once. The Board of Estimate and Apportionment has voted to appropriate $15,000,000 to build the subway from the Manhattan Bridge to Forty-third Street.

CLINTON, N. Y.—Charles Austin Borst, of Clinton, N. Y., has been authorized by the Public Service Commission to exercise rights and privileges under a franchise granted him by the superintendent of highways of the town of Kirkland, N. Y., to erect and maintain transmission lines on Utica Street in Clinton for the purpose of transmitting electricity from his power house to the corporation limits of the village for the distribution of electricity for lamps and motors in Clinton for municipal and commercial purposes.

DUNDEE, N. Y.—The Yates County Electric Railway, which is constructing an electric railway connecting Dundee, Starkey and Starkey Point on Seneca Lake, will soon purchase overhead material for its road, including hard drawn wire, feeder cable and bonds. The railway is owned by Edward L. Bailey, who also owns and operates the Dundee electric light plant, which will furnish electricity for operating the railway.

HILTON, N. Y.—The Public Service Commission, Second District, has granted the Hilton Electric Light, Heat & Power Company permission to issue $5,000 in capital stock and to construct an electric plant and to exercise its franchises in the village of Hilton, and also to issue bonds to the amount of $5,000, the proceeds to be utilized to construct the plant.

MANCHESTER, N. Y.—The Ontario Light & Traction Company, of Canandaigua, N. Y., has purchased the property of the Manchester Flour & Feed Mills, including the water rights and privileges owned by the Manchester Power Company. The purchasing company proposes to utilize the water power to generate electricity. Work has commenced on the installation of two large generators. Later, it is said, the company will increase the water power by the erection of a new concrete dam 500 ft. long and 8 ft. higher than the present structure.

NEW YORK, N. Y.—Work has commenced on the construction of the monorail system, which will extend from Marshall's Corners in the Bronx to City Island. The road will take the place of the present Pelham Park Railroad Company and the City Island Railroad Company, which operate a horse railway system.

NEW YORK, N. Y.—The Public Service Commission has approved an issue of $624,636 in bonds by the Bronx Gas & Electric Company, the proceeds to be applied for refunding $500,000 in bonds and premiums thereon amounting to $65,000 and for outstanding obligations amounting to $59,636. The company asked for permission to issue $1,500,000 to be secured by a first mortgage, of which $747,000 was to be issued for the purpose of retiring $500,000 and other obligations.

NIAGARA FALLS, N. Y.—The Niagara Falls Hydraulic Power & Manufacturing Company has awarded the contract for the construction of a conduit from the Shoellkopf power plant on the Shoellkopf power canal to the proposed new water works plant on the Buffalo Road east of Echota.

NIAGARA FALLS, N. Y.—Work will begin within a year by the Niagara, St. Catherines & Toronto Railway Company on the extension of its railway from Port Colborne to Fort Erie. The company is now building an extension from Welland to Port Colborne, eight miles in length. Contracts have been awarded to the General Electric Company for electrical apparatus, amounting to $20,000, which will be installed at Welland.

SYLVAN BEACH, N. Y.—The Public Service Commission has authorized the construction and operation of an electric light plant in the territory known as Sylvan Beach, in the town of Vienna, to furnish electricity for municipal and other purposes.

SYRACUSE, N. Y.—The Syracuse, Lake Shore & Northern Railroad Company contemplates awarding contracts for construction of the proposed extension between Fulton and Syracuse in the near future.

VESTAL, N. Y.—The Vestal Lighting Company has been granted permission by the Public Service Commission to issue $1,000 in capital stock, the proceeds to be used for the erection of transmission lines in the town of Vestal.

WEST POINT, N. Y.—Bids will be received at the office of the quartermaster at West Point, N. Y., until Nov. 15 for furnishing and installing electric and combination gas and electric light fixtures in Battalion guard house and chaplain quarters, as per drawings and specifications on file in the above office. Forms for proposals will be furnished upon application to the quartermaster.

REIDSVILLE, N. C.—The Town Commissioners have decided to rebuild the municipal electric light plant in Reidsville. The electric and

water plants are located about a mile southwest of the town, and it is now proposed to have the electric plant located in the town. It is said that all of the electrical equipment and part of the steam plant has been purchased. Work on construction of the plant will commence at once.

BARTON, N. D.—The County Commissioners have granted the Barton Farmers Telephone Company permission to erect a telephone line along the county roads.

MANDAN, N. D.—The Mandan Electric Company contemplates the construction of a new building at a cost of $30,000.

STANLEY, N. D.—Plans are being made by the city to install a complete street lighting system.

TOWNER, N. D.—Plans and estimates are being prepared by E. D. Jackson, of St. Paul, Minn., for the installation of an electric light plant in Towner, N. D.

ALLIANCE, OHIO.—Preparations are being made for the construction of an electric railway between Alliance and Ravenna, a distance of 20 miles. The railway, it is said, will be built by a new company, of which C. R. Morley, president of the Stark Electric Company; Henry M. Everett, of the Northern Ohio Traction Company, and others are stockholders.

AMHERST, OHIO.—Plans are being made to increase the output of the municipal electric light plant, which will include the installation of an engine and 1000-kw generator.

SHELBY, OHIO.—Plans for the construction of an electric railway from Shelby to Bucyrus, a distance of 24 miles, and from Shelby to Mansfield, 11 miles in length, are under consideration. The plan includes the construction of a large power plant in Shelby, which would not only furnish electricity for the proposed new lines, but for the existing railway to Norwalk. The cost of the plant and equipment is estimated at $120,000. Preliminary surveys have been made. G. A. Bartholomew, Sherman Culp, of Norwalk, Ohio, and J. A. Shaidnagle, of Massillon, Ohio, are interested in the project.

LAWTON, OKLA.—We are informed that the Lawton & Fort Sill Electric Railway Company, recently incorporated, will commence work on the construction of its proposed electric railway within 60 days. The railway will be 15 miles in length and will connect Lawton, Medicine Park and Fort Sill. The power plant will be located at Medicine Park and will be operated by water power. Simon Smith is president.

LA GRANDE, ORE.—The Eastern Oregon Light & Power Company has filed a mortgage at the office of the county recorder in favor of the Fidelity Trust Company of Wisconsin, to secure an issue of $2,750,000, the proceeds to be used for payment of the property of the Grande Ronde Electric Company and for extensions and improvements to its several plants and distributing systems. The property covered by the mortgage includes the plant and holdings of the Elkhorn Light & Power Company, of Baker County; the Fremont Power Company, of Grant and Baker Counties, including mines; and all the property owned by the Grande Ronde Electric Company, including franchises in La Grande, Cove, Union, Haines, and other towns. Ray Nye is president of the Eastern Oregon Light & Power Company and F. A. Harmon, secretary.

ONTARIO, ORE.—Application has been made to the City Council by D. G. Sutherland, of Ontario, for a franchise to construct an electric or steam railway in Ontario. The proposed railway is to extend throughout the Snake Valley section.

SALEM, ORE.—Plans are being prepared by the Portland, Eugene & Eastern Railway Company for large extensions to its system in Salem and lines operating out of the city, which include the construction of a branch line to Mehama and on into the Santiam country by the way of the State Reform School, Turner, Marion, Peoria, Monroe, Junction City and Eugene, the cost of which is estimated at $150,000. The company is also preparing plans for the construction of a large power plant at Martins Rapids on the McKenzie River, which will involve an expenditure of $1,000,000. The company proposes to extend its system throughout the Willamette Valley.

CHESTER, PA.—Extensions are being made by the Seaboard Steel Casting Company to its foundry and machine shop, which will greatly increase the output of the plant. The company is said to be in the market for an electric crane, a shaper, planer and other machinery.

INTERCOURSE, PA.—Plans are being prepared by the Intercourse Electric Light, Heat & Power Company for extending its transmission lines to Leaman Place, Paradise and Gordonville, a distance of about three miles, to furnish electricity for lamps and motors. George W. Woods, proprietor of the Woods Lane Duck Farm, will utilize electricity on his farm, the service to be supplied by the Intercourse Light, Heat & Power Company. Enos L. Zimmerman is secretary and treasurer.

MERZTOWN, PA.—Preparations are being made by the Mountaintown Telephone Company to extend its telephone lines to Topton, Lyons, Bowers and Kutztown. The exchange for the new line will be located at Merztown. The contract for poles has been awarded to E. DeLong, and for electrical supplies to the Western Electric Company.

SHAMOKIN, PA.—It is reported that the Mineral Railroad & Mining Company, which has recently installed an electric light plant at its Luke Fidler Colliery, in Shamokin, is planning to light all of its collieries by electricity furnished from the Shamokin plant. It is proposed to erect arc lamps about the outside workings of all the collieries and to light the offices. The company has its own telephone system and the electric transmission line will be strung on the telephone poles.

GREAT FALLS, S. C.—Plans are being made to organize the Republic Cotton Mills to erect a plant to be equipped with 25,000 spindles, 640 looms, etc. The company is capitalized at $600,000. The mills are to be operated by electricity. Robert S. Mebane, of Graham, N. C., is president.

HURON, S. D.—Arrangements have been completed by the Central Dakota Telephone Company for establishing an automatic telephone system in Huron.

VIENNA, S. D.—Negotiations have been closed by the Town Board for the purchase of the local electric light plant. The price paid for the plant was a little less than $5,000.

WATERTOWN, S. D.—Plans are being made by the Watertown Light & Power Company for the construction of a new power station, which will be equipped with 60-cycle, three-phase equipment. The company would like to receive catalogues and information from manufacturers of electrical machinery and apparatus. For further information address James W. Ferris, secretary and manager.

CHATTANOOGA, TENN.—The City Council has granted D. J. Duncan and associates a franchise to construct an electric railway in Chattanooga, Tenn.

CHATTANOOGA, TENN.—The Chattanooga Railway & Light Company is reported to have issued bonds to the amount of $15,000,000; the proceeds of $10,000,000 will be used for general improvements and extensions to its electric plant, transmission lines, railways, etc.

CANADIAN, TEX.—Plans are being prepared for the construction of an electric light plant in Canadian. C. W. Conrad, of Topeka, Kan., civil engineer, has charge of construction of the plant.

EAGLE PASS, TEX.—Plans are being considered by the Eagle Pass Industrial League for the organization of a company to construct a hydroelectric power plant. The plan includes the purchase of the local electric light plant, water works system and ice factory, all to be operated by electricity transmitted from the proposed plant. It is also proposed to furnish electrical energy for industrial plants in Eagle Pass and Porfirio Diaz, across the Rio Grande River in Mexico.

ELGIN, TEX.—W. H. Kennedy, Mayor, writes that the town is planning to install a municipal electric light plant, but would give a franchise to any responsible company to install a plant.

GREENVILLE, TEX.—The city is contemplating issuing $50,000 in electric light bonds.

TERRELL, TEX.—At an election to be held Nov. 23 the citizens will vote on the proposition to issue $10,000 in bonds for improvements to the municipal electric light plant and water works system.

FAIRVIEW, UTAH.—The citizens are reported to be considering the question of purchasing the electric plant of the Fairview Electric Light Company to be owned and operated by the municipality.

FARMINGTON, UTAH.—Work has commenced on the construction of the power station of the Salt Lake & Ogden Railway Company at Ogden, Utah, which will involve an expenditure of $150,000. The initial equipment will include motor-generator sets with total rating of 1200 hp., the output to be increased as requirements demand. Substations will be erected at Stockdale, Lagoon, Clearfield and Ogden, at a cost of $25,000 each. The Falkenau Electrical Construction Company, of Chicago, Ill., has charge of the construction of the plant.

FORT DOUGLAS, UTAH.—Bids will be received at the office of the constructing quartermaster, Fort Douglas, Utah, until Nov. 20 for the construction of one double set company officers' quarters, with plumbing, heating, electric wiring and fixtures; one quartermaster store, with electric wiring and fixtures, at Fort Douglas, Utah. Plans and specifications, blank proposals, etc., may be seen in the above office. Lieut. Kenneth P. Williams is constructing quartermaster.

SALT LAKE CITY, UTAH.—The State Board of Examiners and Trustees of the Agriculture College are considering the question of installing an electric power plant at the Agriculture College, for which funds have been appropriated by the State Legislature.

SALT LAKE CITY, UTAH.—Application has been made to the State engineer by A. W. Gallacher, of the Utah Light & Railway Company, for the privilege of diverting 6000 cu. ft. of water from the flow of the Middle Canyon Creek in Tooele County, to be utilized to generate electricity.

SALT LAKE CITY, UTAH.—The San Francisco, Idaho & Montana Railway Company, which was organized to construct an electric railway from Caldwell, Idaho, to Jordan Valley, Ore., thence via Duncan, to Winnemucca, Nev., is reported to have been acquired by the Oregon Short Line Railroad Company. Grading has been finished to the Snake River, a distance of 20 miles, and track laying will probably be finished this fall, where connection will probably be made with the Oregon Short Line. It is expected that the new owners will extend the railway as far as Jordan Valley section at an early date, a distance of 56 miles. A contract has been awarded to D. M. Grogan, of Vail, Ore., for construction of the proposed Willow Creek branch of the Malheur Valley from the present terminus in Vail to Brogan, about 25 miles distant.

BENNINGTON, VT.—The Bennington Light & Power Company is making improvements and extensions to its power plant including the installation of a large engine.

PITTSFORD, VT.—Preparations are being made for lighting the Village of Pittsford by electricity. The town has made an appropriation for street lighting, and sufficient number of customers to warrant

the extension of the line have been secured. It is said that the Rutland Railway & Light Company will soon commence work on the extension of its transmission line from the Mendon station to the substation to be erected about one and one-half miles south of the Pittsford Mills, from which electricity will be furnished in the town.

RUTLAND, VT.—Announcement has been made by the Rutland Railway, Light & Power Company that it will extend its railway to Poultney and ultimately to Granville, N. Y. Arrangements have been made to finance the construction of the railway from the main line near Castleton through the slate quarries to Poultney, provided a free right of way is granted and the town of Poultney grant the company franchises on favorable terms. The company will supply electricity for lamps and motors along the route of the railway.

LURAY, VA.—The Town Council has granted the Mutual Telephone Company a franchise to erect a telephone system in Luray.

IONE, WASH.—The County Commissioners are reported to have granted a 25-year franchise to the Ione Water & Light Company.

MABTON, WASH.—Application has been made to the City Council by J. A. Humphrey and associates for a franchise to construct and operate a street railway in the town. It is said that the Yakima Valley Power Company is back of the project.

SPOKANE, WASH.—T. S. Lane, of Butte, Mont., president of the syndicate recently organized to purchase the control of the Spokane Company, states that the Home Telephone Company, of Spokane, Wash., will have its plant in Spokane in operation within six months and that $400,000 will be expended for equipment.

ZILLAH, WASH.—The Northwest Light & Power Company, of North Yakima, Wash., which is erecting a high-tension transmission line through the Yakima Valley from Naches to Kennewick, has agreed to build a loop from the main line through Zillah, provided the residents agree to take 50 hp. The company will furnish electricity for pumping water for irrigation from the Sunnyside Canal at that point to lands above the large ditch. George Arrowsmith is manager of the company.

BROOKLIN, W. VA.—Application has been made to the town officials by the New Martinsville Electric Light, Heat & Power Company, of New Martinsville, W. Va., for a franchise to establish an electric light plant in Brooklin.

FORT SPRING, W. VA.—Preparations are being made by B. F. Mann for the construction of a hydroelectric power plant to develop 1000 hp for transmission by electricity. The plans call for the construction of a dam 47 ft. high, 150 ft. at the base and 250 ft. at top. Surveys will be made at once and construction work will begin next spring.

GREAT CAPACON, W. VA.—Plans are being considered by the Hydro-Electric Developing Company for the construction of a hydroelectric power plant at Edes Fort, on the Great Capacon River, which will include the construction of a dam with a 100-ft. head, where it is estimated that 3000 hp can be developed for transmission by electricity. The equipment will include four 4000-hp vertical turbines direct-connected to vertical type generators. Samuel R. Boyer, of Steelton, Pa., secretary, will have charge of the work until an engineer is appointed.

MANNINGTON, W. VA.—The City Council has granted a franchise to the Fairmont & Mannington Traction Company to connect with the Morgantown & Dunkard Valley Electric Railway, which has also been granted a franchise and will construct an electric railway from Mannington to Blacksville, W. Va.

CRANDON, WIS.—Preparations are being made for the installation of an electric power plant and pumping station in Crandon in the near future, bonds for which have already been issued.

JANESVILLE, WIS.—The Lewis Knitting Company is erecting three 4-story buildings, all of which will be equipped for electric motor drive.

LA CROSSE, WIS.—Preparations are being made by the La Crosse Water Power Company for the construction of an interurban railway to extend from Winona to La Crosse and thence to Sparta, the cost of which is estimated at $3,000,000. The company will soon apply to the City Council of La Crosse for a franchise to enter the city and similar franchises will be asked of the Councils at Winona and Sparta. The railway will furnish both freight and passenger service.

MADISON, WIS.—The Badger State Shoe Company, it is reported, will install a producer gas engine and electric generator in its new factory.

MILWAUKEE, WIS.—The City Council is considering the question of purchasing a site near the city hall and erecting a building to install the power plant which is now located in the basement of the city hall. The cost of $22,000 per year for operating the plant is not considered economical and it is proposed to get a greater return from the plant by furnishing electricity to a section of the Seventh Ward.

NORTHFIELD, WIS.—The Northfield Farmers' Telephone Company is contemplating the erection of a telephone line to Merrillan. H. L. Hanson is secretary.

OSHKOSH, WIS.—Electrical equipment is being purchased by the Hydes Electric Power Company for its power plant located in Ellis Junction, Wis.

OSHKOSH, WIS.—The Morgan Company, it is reported, contemplates erecting an addition to its plant and installation of additional machinery, including wood-working machinery, motors, exhaust fan and possibly an electric generating unit.

NANTON, ALTA, B. C.—A municipal electric light plant is being installed in Nanton, the equipment of which will include a 75-kw, three-phase, 2300-volt General Electric generator. The plant will furnish electricity for both street and domestic lighting. Series arc lamps will be used for street lighting. An appropriation of $16,000 was recently made for constructing the plant. A. S. Thurber, of Nanton, is consulting engineer.

OSHAWA, ONT., CAN.—Arrangements are being made by local capitalists for the construction of an electric railway from Cobourg to Toronto. Application will be made to the Dominion Parliament for a charter for the road. The railway will be operated under the name of the Toronto & Eeastern Railway and will connect Oshawa, Whitby and Bowmanville.

New Industrial Companies.

THE ANIMATED SIGNS COMPANY, of Kittery, Maine, has been chartered with a capital stock of $100,000 for the purpose of manufacturing signs of all kinds. The officers of the company are: A. H. Peavey, president, and E. J. Burnham, of Kittery, Maine.

THE AUTOMATIC JACK COMPANY, of Bloomfield, Ind., has been chartered with a capital stock of $30,000 by P. J. Horrah, Charles E. Benefield and Charles E. Henderson. The company proposes to manufacture a lifting jack and wire stretcher.

THE BERGEN-FRANKLIN AUTO COMPANY, of Brooklyn, N. Y., has filed articles of incorporation with a capital stock of $10,000 for the purpose of manufacturing motors, engines, machines, etc.; also automobiles, cars, carriages, etc. The incorporators are: Frederick Albert, Frank Schmitter and A. Schmitter, all of Brooklyn, N. Y.

THE CARBON REMOVER COMPANY, of Staatsburgh, N. Y., has been incorporated with a capital stock of $10,000 to manufacture compounds used to remove carbon deposits from engines. The incorporators are: George Brock, of New York, N. Y.; C. W. H. Arnold and Harry B. Vosburgh, both of Poughkeepsie, N. Y.

CHARLES E. CHAPIN COMPANY, of New York, N. Y., has been incorporated by Franklin G. Chapin, of Greenwich, Conn.; Frederick W. Jabelman, of Brooklyn, N. Y., and Alexander H. Babcock, of New York, N. Y. The company is capitalized at $10,000 and proposes to manufacture electrical brushes and supplies.

THE CHARTER ELECTRIC COMPANY, of Chicago, Ill., has been chartered with a capital stock of $250,000 for the purpose of manufacturing, selling and installing electrical appliances. The incorporators are: G. C. Cummings, J. A. Kick and A. Wray.

THE COWLES-MCDOWELL ENGINEERING COMPANY, of Chicago, Ill., has been incorporated with a capital stock of $25,000 by Irving Cowles, Ernest H. McDowell, Ewald J. Pfeiffer, William C. Moody, all of Chicago, Ill. The company proposes to do a general engineering and contracting business.

THE ELECTRIC MANUFACTURING AGENCY COMPANY, of New York, N. Y., has been chartered with a capital stock of $1,000 by William Stuart, Francis Harrison, both of London, Eng., and John S. C. Bailey, 63 Wall Street, New York, N. Y. The company proposes to deal in electric and other apparatus.

THE FEVAL ENAMEL INSULATED WIRE COMPANY, of Chicago, Ill., has filed articles of incorporation with a capital stock of $12,500 by C. L. Backus, A. M. Higgley, F. L. Silvertson, H. P. Simonton, all of Chicago, Ill. The company proposes to manufacture electrical supplies.

THE FLORENCE NOVELTY COMPANY, of New York, N. Y., has been chartered with a capital stock of $15,000 by George F. McGiry, of Brooklyn, N. Y.; George N. McKane and M. E. McKane, both of Sheepshead Bay, N. Y. The company proposes to manufacture ornamental electric lamps.

THE GLOBE POWER COMPANY, of Chicago, Ill., has been incorporated with a capital stock of $30,000 for the purpose of dealing in and selling all kinds of machinery, using all kinds of motive power, establishing garages and dealing in supplies, etc. The incorporators are: C. C. McArthur, A. Shelden and E. J. Stanley.

THE IDEAL ELECTRIC COMPANY, of Chicago, Ill., has been chartered with a capital stock of $15,000 for the purpose of manufacturing automobiles, by J. A. Ryerson, S. H. Peterson and M. Mathison, all of Chicago, Ill.

THE INTERSTATE CONTRACTING COMPANY, of Ligonier, Ind., has been incorporated, with a capital of $50,000. The company proposes to construct and equip electric railroads. The directors are: D. T. Mohabb, Nicholas Knol and William T. Abbott.

THE INTERNATIONAL PNEUMATIC SERVICE COMPANY, of Boston, Mass., has been incorporated for the purpose of dealing in pneumatic and vacuum transmission service. The company is capitalized at $150,000 and the officers are: R. F. Miller, Boston, Mass., president, and W. E. Cooper, of Cambridge, Mass., treasurer.

THE LEWELL MANUFACTURING COMPANY, of Chicago, Ill., has been incorporated with a capital stock of $30,000 by G. E. Chamberlain, C. E. Gilman and A. J. Ehrenberger. The company proposes to manufacture and sell machinery.

MEISSNER-FANGEMANN, INC., of Brooklyn, N. Y., has filed articles of incorporation with a capital stock of $10,000 for the purpose

of manufacturing motors, engines, and machines, cars, carriages, etc. The incorporators are: Charles F. Meissner, John G. Fangemann and M. Meissner, all of Brooklyn, N. Y.

THE MURRAY ENGINEERING COMPANY, of New York, N. Y., has been incorporated with a capital stock of $1,000 for the purpose of carrying on a business as architects and engineers. The incorporators are: William V. Murray, Marle R. Murray and John T. Nichelson, all of New York, N. Y.

THE NATIONAL ELECTRICAL ADVERTISING COMPANY, of Evansville, Ind., has been incorporated to manufacture an electrical advertising device. The capital stock is $50,000. J. A. McCoy is president, and C. P. Schule, secretary.

THE PETERSON ENGINEERING COMPANY, of New York, N. Y., has been incorporated with a capital stock of $25,000 by J. W. Peterson, of East Orange, N. J.; G. A. Conover, of Bayonne, N. J., and D. E. Deuel, of New York, N. Y. The company proposes to do a general engineering and construction business.

THE PRE-HEATING APPLIANCE COMPANY has filed articles of incorporation with the Secretary of State. The company is capitalized at $500,000 and proposes to manufacture electrical devices, etc. The incorporators are: W. S. Potter, B. L. Beck, of New York, N. Y.; W. B. Hutchinson, of Newark, N. J., and H. W. Davis, of Wilmington, Del.

THE TWENTIETH CENTURY ELECTRICAL CONSTRUCTION COMPANY, of Plymouth, Mass., has been incorporated by Burton Dinsmore, of Plymouth, Mass., and Winfield W. Rogers, of Swampscott, Mass. The company is capitalized at $12,000 and proposes to deal in electrical machinery.

THE UNITED ELECTRIC SMELTERS, of Newark, N. J., has been incorporated with a capital stock of $150,000 by James H. Reid, of Newark, N. J.; Edward A. Filkins and Frank E. Gollier, of New York, N. Y.

THE WESTERN COIL COMPANY, of Chicago, Ill., has been incorporated with a capital stock of $1,000 by Charles O. Olson, Martin E. Olson and G. E. Little, all of Chicago, Ill. The company proposes to deal in x-ray coils.

New Incorporations.

VALDEZ, ALASKA.—The Valdez-Fairbanks Long Distance Telephone Company has been formed for the purpose of erecting a telephone line into the interior, which will ultimately be extended to Fairbanks.

SAN DIEGO, CAL.—The San Diego-El Cajon-Escondido Company has been incorporated with a capital stock of $2,500,000 by G. W. Pursell, H. G. Crowe, A. C. Riordan, of San Diego, Cal.; W. L. Ramey, C. O. Kelly, of Escondido, and others.

CHAMPAIGN, ILL.—The Illinois Consumers' Light Company has filed articles of incorporation with the Secretary of State. The company is capitalized at $2,500, and the incorporators are: George M. Mattis, W. H. Carnahan and Charles Zilly, all of Chicago.

CHICAGO, ILL.—The Iowa Light & Traction Company, a South Dakota corporation, has filed articles of incorporation with the Secretary of State for the purpose of maintaining an Illinois office. The company is capitalized at $500,000. Joseph W. Gillis, 153 La Salle Street, Chicago, Ill., is one of the incorporators.

SPRINGFIELD, ILL.—Articles of incorporation have been filed with the Secretary of State by the Illinois Traction Company for the Decatur Belt Railway Company and the Edwardsville Belt Railway Company. George M. Mattis, W. H. Carnahan, Charles Zilly, B. E. Bramble and C. E. Cox, of Champaign, Ill., are incorporators and members of the board of directors of both companies.

TENNYSON, IND.—The Tennyson Mutual Telephone Company has filed articles of incorporation with the Secretary of State. The capital stock is placed at $2,000. The company proposes to build a telephone exchange and system in Tennyson and extend the lines throughout Warrick County. E. O. Simpson, W. O. Hendrickson, Adam Barchell and others are directors.

EAST TAWAS, MICH.—Articles of association of the following companies have been filed in the office of the county clerk of Isoco County: The Cook County Hydro-Electric Generating Company, the Thompson Hydro-Electric Generating Company, the Loud Hydro-Electric Generating Company, and the Five Channels Hydro-Electric Generating Company, which have all been organized with the same stockholders as follows: Edward F. Loud, H. Kimball Loud and L. A. Wood.

HARLOWTON, MONT.—The Meagher-Fergus Telephone Company has been incorporated with a capital stock of $40,000 by Lewis Penwell, of Helena, Mont.; M. N. Stevens, of Harlowton, and others.

NEBRASKA CITY, NEB.—Articles of incorporation have been filed for the Nebraska City Light & Power Company with a capital stock of $100,000. The incorporators are: E. K. Bradley, H. H. Hanks, J. F. Johnson, W. M. McNamara, Fred E. Johnson, A. G. Hastie and G. E. Hanks. The plant is located at the works of the King Alfalfa Milling Company.

GLOVERSVILLE, N. Y.—The Garoga Water Power & Transmission Company has been chartered by Mortimer Eversett, of Gloversville, N. Y.; William C. Dunlop, of New York, N. Y., and H. M. Brinckerhoff, of Briar Cliff, N. Y. The company is capitalized at $50,000, and proposes to supply electricity for lamps, heat and motors, and water power in Ephratah, Johnstown, Gloversville, Fonda and Fultonville.

MINEVILLE, N. Y.—The Mineville Light, Heat & Power Company has been granted a charter with a capital stock of $10,000. The company proposes to supply electricity for lamps, heat and motors in the towns of Moriah, North Hudson, Elizabethtown and Westport. The incorporators are: Sheldon Norton, Solomon LeFevre, Samuel Dongan, all of Mineville, N. Y.

TRUXTON, N. Y.—The Truxton & Chening Telephone Company has been incorporated with a capital stock of $2,000 by A. Risley Muller, William Bell and W. R. Bennett, all of Truxton, N. Y.

COLUMBUS, OHIO.—The Ohio Home Telephone Company has been incorporated with a capital stock of $500,000 by F. L. Griffith, Harlan Reed, Howard Howells, W. C. Henderson and John H. Otto. The company was formed for the purpose of taking over the property of the United States Telephone Company, bringing to a close negotiations which have been in progress for over a year for a consolidation of all independent telephone interests in the State of Ohio.

NEW CARLISLE, OHIO.—The New Carlisle Light Company has been chartered with a capital stock of $10,000 by Harry G. Fisher and others.

CHECOTAH, OKLA.—The Checotah-Texanna Telephone Company has been chartered, with a capital stock of $4,000, by E. K. Cross, J. E. Wise and M. M. Cross.

HARMON, OKLA.—The Harmon Telephone Company has been chartered with a capital stock of $2,500 by S. C. Husted, C. H. Ernest, M. L. Husted, E. R. Mohoar and J. L. Butts, of Gould, Okla.

LAWTON, OKLA.—Articles of incorporation have been filed with the Secretary of State for the Lawton & Fort Sill Electric Railway Company, with a capital stock of $200,000, to operate an electric railway in Lawton with extension to Fort Sill, Medicine Park and other points in Comanche County, about 20 miles in length. The directors are: Simon Swift, of Oklahoma City, Okla.; W. H. Pattie, D. L. Sleeper and J. H. Miller, of Tulsa, and J. B. Sleeper, of Lawton.

NOWATA, OKLA.—The Coffeyville-Nowata Railway & Power Company has been incorporated with a capital stock of $200,000 for the purpose of constructing an electric railway from Coffeyville, Kan., to Nowata, Okla., 23 miles in length. The directors are: J. C. Denton, W. V. Thraves and J. A. Tillotson, of Nowata, Okla.; John B. Pollard, of Kansas City, Mo., and W. P. Brown, of Coffeyville, Kan.

SAPULPA, OKLA.—Articles of incorporation have been filed for the Sapulpa Electric Light Company with a capital stock of $150,000 by Willis H. M. Adams, J. E. Kimball and Joseph Kergegan, all of Guthrie, Okla., and Charles F. Lane, of Philadelphia, Pa.

MARSHFIELD, ORE.—The Coos Bay Electric Railway Company has been chartered with a capital stock of $1,500,000 by James H. Flannagan and others.

ALTOONA, PA.—The Altoona, Hollidaysburg & Bedford Springs Electric Railway Company has been chartered to construct an electric railway from Altoona to Bedford Springs, a distance of 50 miles, surveys for which are now being made. John G. Burns, of Pittsburg, Pa., is president, and F. W. Patterson, of Altoona, Pa., engineer.

WAYNESBURG, PA.—Articles of incorporation have been filed for the Waynesburg & Blacksville Street Railway Company by Samuel Eakin, of Wadestown. W. Va., president; L. L. Thomas, R. E. Lent, M. B. Patterson and Charles H. King. The company is capitalized at $40,000 and proposes to construct an electric railway from the Pennsylvania and West Virginia State line at Robert's Run along the Roberts and Smiths creeks to Waynesburg, a distance of 14 miles.

DURANGO (P. O. LOTT), TEX.—The Durango Telephone Company has been incorporated with a capital stock of $700 by J. H. Cox, G. L. Farmer and T. C. Farmer.

LEAGUE CITY, TEX.—The League City Telephone Company has filed articles of incorporation with a capital stock of $2,500. The incorporators are: George W. Butler, J. E. Walker, J. P. Atinson, O. V. King and R. H. Scholes.

KAMAS, UTAH.—The Kamas-Woodland Telephone Company has been incorporated with a capital stock of $12,000 and the following named officers: Charles B. Stewart, president; J. O. Park, vice president, and John B. Hoyt, secretary and treasurer.

SEATTLE, WASH.—The Columbia Irrigation & Power Company, capitalized at $100,000, has been incorporated by M. A. Robinson and H. A. Hyland.

SPOKANE, WASH.—The Kettle River Water Power Company, of Spokane, has been incorporated with a capital stock of $500,000 by E. L. Tate, R. L. Thomson, W. W. McCreary, Chas. Grant and R. H. Vorhees.

Personal.

MR. F. Z. McGUIRE, who had been been ill for some months, has recovered his health and resumed the active direction of his various enterprises.

MR. J. L. BAILEY presented a paper at the meeting last week of the Baltimore branch of the National Electric Light Association on the subject of "The Purposes and Applications of Accounts."

MR. CHAS. E. CANADA has resigned his position with the Hendrie & Bolthoff Manufacturing & Supply Co., of Denver, to identify himself with the sales department of the American Steel & Wire Company of Denver.

MR. J. W. McCROSKY, manager of construction for J. G. White & Co., Ltd., of London, arrived in New York Nov. 3 for a short visit, during which his address will be care J. G. White & Co., 43 Exchange Place, New York City.

MR. E. C. SORNBORGER has become identified with Allis-Chalmers Company in the capacity of a sales engineer in its pumping engine and hydraulic turbine department. Mr. Sornborger received his early training and practical engineering experience in the United States Navy and later entered the merchant service as assistant engineer. Subsequently he was connected with the Buffalo Steam Pump Company, Gordon Steam Pump Company and the Snow Steam Pump Works. Lieutenant Sornborger still retains his interest in naval affairs, being the commanding officer of a division of the naval militia of Buffalo.

MR. MYRON E. TERBUSH, for several years connected with the estimating division of the contract department of the Commonwealth Edison Company, of Chicago, has resigned to become manager of the new business department of the Topeka Edison Company, of Topeka, Kansas. Mr. Terbush is a Harvard alumnus of the class of 1900, and after graduation was for two years employed by the Boston Elevated Railway Company. Since that time he has been connected with the Commonwealth Edison Company.

MR. FRANK W. FRUEAUFF, of New York, president of the National Electric Light Association, was in Chicago on Oct. 28 to attend the annual dinner of the Commonwealth Edison branch of that association. He was entertained at luncheon at the University Club on that day by a party of central-station men consisting of Messrs. L. A. Ferguson, J. F. Gilchrist, W. A. Fox, P. Junkersfeld, E. W. Lloyd, George H. Lukes, S. M. Bushnell and George H. Jones. In the afternoon Mr. Frueauff was taken for an automobile ride around the city.

MR. RALPH W. POPE, secretary of the American Institute of Electrical Engineers, has returned to New York after an extensive official tour of the Far West and the Pacific slope. Judging from clippings in our newspaper service, Mr. Pope not only had a very enjoyable time, but greatly strengthened the Institute by his trip. Everywhere there was evidence of the warm personal esteem in which he is held by the membership, together with recognition of the rare ability that has been such a great factor in the upbuilding of the body.

MR. JOHN A. RADFORD, of Chicago, has acquired control of the Grinnell Electric & Heating Company of Grinnell, Iowa, where he will make his residence in Grinnell, and take the active management of the company of which he is president, but will continue in part his consulting practice. Mr. Radford has recently completed the engineering of several large power plants, but is perhaps best known in engineering circles as the chief engineer of the Commonwealth Edison Company's Fisk Street station in Chicago during the first two momentous years of its operation.

Obituary.

MR. CHARLES F. SPALDING.—Mr. Charles F. Spalding, prominent in the business life of Chicago, although comparatively a young man, died on Oct. 24, after an illness of short duration. Mr. Spalding was a director in several banks and connected with a number of industrial enterprises. He was a director of the North Shore Electric Company and was well known to many electrical men. He was a son of the late Jesse Spalding, who was at one time a director of the Chicago Edison Company. Mr. Spalding was buried on Oct. 27, and the list of honorary pallbearers included some of the most prominent men in the city.

MR. JOHN R. VAN WORMER.—Mr. John R. Van Wormer, general manager of the Lincoln Safe Deposit & Warehouse Company, New York, died Oct. 27 from the effects of a stroke of paralysis received Sept. 28. Mr. Van Wormer was born in Adams, N. Y., March 14, 1849, and was educated in the military academy in his native town. Colgate University conferred upon him the honorary degree of Master of Arts several years ago. He began his business life as a telegraph operator and was afterward engaged in newspaper work. He occupied several political positions of prominence at Albany and Washington and was closely associated with Postmaster General Thomas L. James during the period of the "Star Route" frauds investigation. Mr. Van Wormer was prominently identified with club life in New York. He never married.

Trade Publications.

RURAL TELEPHONY.—Much information concerning rural telephone equipments is given in a 48-page booklet issued by the Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y.

ELECTRIC HOISTS AND WINCHES.—The Sprague Electric Company is sending out an attractive pamphlet, No. 233, which calls attention to its line of electric hoists, shovels, winches, etc.

TELEPHONE CABLE TERMINALS.—Bulletin No. 3 of the Sterling Electric Company, Lafayette, Ind., is a well-illustrated 24-page publication devoted to cable terminals and protectors for all classes of telephone service.

GAS PRODUCERS for bituminous fuels are fully described in circular W. M. No. 503 of the Westinghouse Machine Company, East Pittsburgh, Pa. Much data relating to thermal efficiencies are given from actual operating tests.

GAS ENGINES, of the single-cylinder throttling type, designed for use with natural, illuminating and producer gas and gasoline, are discussed in an instructive manner in a well-executed bulletin designated as K-21 of the Du Bois Iron Works, Du Bois, Pa.

BOILER WATER TREATMENT.—An artistic catalog of the Dearborn Drug & Chemical Works, 1029 West Thirty-fifth Street, Chicago, contains a complete description of the processes involved in the purification of boiler feed water.

MOTOR-DRIVEN ALARM.—The Klaxon sound producer, which consists of a battery type motor driving a toothed wheel for vibrating a diaphragm of a megaphone, is well illustrated and described in a catalog issued by the Lovell-McConnell Manufacturing Company, Newark, N. J.

CARE OF BATTERIES.—The Willard Storage Battery Company, Cleveland, Ohio, has issued a revised edition of its instruction book for the care and maintenance of train-lighting batteries. All of the details of the batteries, and remedies for troubles that may arise are fully discussed.

VEHICLE BATTERIES.—Instruction for the operation and care of vehicle batteries are given in detail in bulletin No. 116 of the Electric Storage Battery Company, Philadelphia. The bulletin contains a reprint of a paper read by H. M. Beck at the convention of the Society of Automobile Engineers.

IMPREGNATING APPARATUS.—The J. P. Devine Company, Buffalo, N. Y., has issued mailing cards calling attention to the Passburg vacuum drying and impregnating apparatus. It is claimed that this apparatus saves one-third of the time and money expended when other devices are employed in the impregnating process.

FAN MOTORS FOR TELEPHONE BOOTHS.—In Booklet No. 3839 of the General Electric Company is illustrated and described a line of 8-in. four-blade fans designed for use in residences, small offices and telephone booths. It also describes a 12-in. six-blade fan for office use. This line includes fans for both alternating and direct current.

OPALUX GLASSWARE.—The Central Electric Company, Chicago, is distributing a new folder descriptive of Opalux glassware. This folder is of particular interest in that it announces the new method of packing and gives considerable information on the cost of maintenance, etc. Efficiency curves are given to show the light distribution with 100-watt lamps.

RECORDING THERMOMETERS.—Compensated recording thermometers for low and atmospheric ranges of temperature are illustrated, listed and briefly described in bulletin No. 112 of the Bristol Company, Waterbury, Conn. These thermometers are well adapted for recording the temperatures of condenser water, feed water, superheated steam, flue gas, and of generators and transformers.

RAILWAY MOTORS.—Two publications illustrating and describing in more or less detail the latest construction in connection with 500-volt, 40-hp and 600-volt, 65-hp railway motors, have been issued by the General Electric Company under numbers 4693 and 4692, respectively. These publications describe the GE-88 and GE-210 motors, and include tables of schedule speeds and various characteristic curves and motor dimensions.

SWITCHES FOR SPINNING FRAMES.—The extensive adoption of fire-proof devices in cotton-mills, flour-mills, saw-mills and other establishments operating under similar conditions has made necessary a compact, fire and dust-proof, oil-break switch of moderate cost. A switch of this character is described in Bulletin No. 4682, recently issued by the General Electric Company. This publication contains, also, dimensions and prices.

THE DYNATAK.—The Electric Speedometer & Dynamometer Company has issued a handsome catalog descriptive of the Hopkins "Dynatak" and electric speedometer. The former utilizes the thermo-couple to indicate the condition of internal operation of automobile and motor-boat gasoline engines, and the latter is an efficient magneto-electric device for indicating in terms of speed the revolutions of the driving shaft of automobiles, motor boats, etc.

LUMINOUS ARC HEAD-LAMPS.—The luminous arc which has made possible the economical operation of a highly efficient street-lamp is found to be ideal for use in street railway head-lamps. The need of such a head-lamp is the natural result of the rapid growth of street and interurban traffic, and increase in the size and speed of the cars employed. The General Electric Company has placed on the market luminous arc head-lamps for both street service and use on mining locomotives. The principal advantage of these head-lamps is high efficiency; other advantages are enumerated in Bulletin No. 4698, recently issued by the company.

WISCONSIN ENGINES.—The first of a series of bulletins to be issued from time to time by the Wisconsin Engine Company, Corliss, Wis., is a handsome specimen of the printing and engraving arts. An interesting feature is that the cover of this first issue, while having the appearance of the usual catalog cover, will accommodate future bulletins through the use of an ingenious binding device. Another feature is that

white spaces are provided for the filing marks of the user of the catalog. In addition to a well-written description of the type of Corliss engine which forms the subject of the present bulletin, accompanied by numerous illustrations, several pages of useful information for engineers are included.

UTILIZATION OF EXHAUST STEAM.—"How to Utilize Exhaust Steam" is the sub-title of a catalog of the Cochrane Open Feed Water Heaters which has just been issued by the Harrison Safety Boiler Works, Philadelphia, Pa. The title is justified by the fact that fully two-thirds of the book is occupied by discussions and illustrations of the different ways of employing exhaust steam, as for heating, drying, evaporating, heating water for boiler feeding and for use in dye works, tanneries, bleacheries and paper mills, etc. In a chapter entitled "The Possibilities of a Pound of Steam" it is pointed out that at the best only 10 or 12 per cent of the total heat energy in steam can be converted into mechanical work, and that the remainder still present in the exhaust of an engine or turbine is as good for most of the purposes for which steam is employed as is the same weight of live steam. In a chapter on "Condensing Plants," the advantages of steam-driven auxiliaries are discussed. The section on "Corrosion" gives the latest results, showing that air in solution in the water is a necessary condition to corrosion and pointing out that a large part of this can be driven off from the water by spraying the latter through a steam bath, as in the Cochrane Open Heater. The book contains 104 pages, 6 x 9 in.

Business Notes.

McGOVERN, ARCHER & COMPANY SALES.—Among the recent sales made by McGovern, Archer & Company are two 300-hp, Heine water-tube boilers to the Hummelstown (Pa.) Consolidated Water Company, and two of the same type to the Lebanon Water Company. Quite a lot of small electrical apparatus has also been sold, and the firm reports that business is quite brisk.

THE COMMERCIAL SWITCHBOARD MANUFACTURING COMPANY, recently incorporated in Denver, Col., is becoming a very desirable factor in the mountain territory in the manufacture of steel cut-out cabinets. The excessive freight rates from Eastern factories and the convenience jobbers find in having orders filled quickly and special changes made as needed, have combined to increase the company's output.

THE AGUTTER-GRISWOLD COMPANY, Seattle, Wash., which recently suffered heavy fire loss in the manufacturing department, is again fully equipped for business at the old location, 411 Occidental Avenue. As the result of the fire considerably more floor space was secured, which allowed of a complete re-arrangement of machinery so that now the various departments are segregated. The firm will continue to manufacture the complete line of switches, steel cabinets, panel-boxes, panel-boards and switchboards, as well as its more recently developed universal metering panels and meter boxes.

DIRECTORY OF ELECTRICAL ASSOCIATIONS, SOCIETIES, ETC.

Alabama Light & Traction Association. Secretary, Lloyd Lyon, Mobile, Ala. Next meeting, Birmingham, Nov. 15 and 16, 1909.

American Association of Electric Motor Manufacturers. Secretary, W. H. Tapley, 29 West 39th St., New York. Next meeting, St. Louis, Mo., Nov. 15-18, 1909.

American Electrochemical Society. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa.

American Electro-Therapeutic Association. Secretary, Dr. Albert C. Geyser, 158 West 76th St., New York City.

American Institute of Electrical Engineers. Secretary, Ralph W. Pope, United Engineering Societies Building, 33 West 39th St., New York. Meetings, second Friday of each month, excepting June, July, August and September.

American Street & Interurban Railway Accountants' Association. Secretary, H. E. Weeks, Davenport, Ia.

American Street & Interurban Railway Engineering Association. Secretary, John W. Corning, Boston Elevated Railway Company, Boston, Mass.

American Street & Interurban Railway Association. Secretary, B. V. Swenson, United Engineering Societies Building, 29 West 39th St., New York.

Arkansas Association of Public Utility Operators. Secretary, J. E. Cowles, Little Rock, Ark. Next meeting, Pine Bluff, Ark., 1910.

Association of Iron and Steel Electrical Engineers. Secretary, G. H. Winslow, 509 Perry-Payne Building, Cleveland, O.

Association of Railway Telegraph Superintendents. Secretary, P. W. Drew, Room 511, Harvester Building, Chicago. Next meeting, Los Angeles, Cal., May, 1910.

Association of Car Lighting Engineers. Secretary, C. B. Colegrove, Illinois Central Railroad, Electrical Department, Chicago. Next semi-annual meeting, Buffalo, N. Y., June 7 and 8, 1910. Next annual meeting, Chicago, Oct. 4, 5, 6 and 7, 1910.

Association of Edison Illuminating Companies. Secretary, D. L. Huntington, Spokane, Wash.

Association of Electric Lighting Engineers of New England. Secretary, W. H. Cole, Waltham, Mass. Annual meetings held in Boston, third Wednesday in March.

Boston Electrical Show. Secretary, Chester I. Campbell, 5 Park Square, Boston. Mechanics' Building, Nov. 15-25, 1909.

Canadian Electrical Association. Secretary, T. S. Young, 104 Confederation Life Building, Toronto, Ont.

Canadian Street Railway Association. Secretary, Allan H. Royce, 48 King St., W., Toronto, Ont.

Central Electric Railway Association. Secretary A. L. Neereamer, Indianapolis, Ind.

Chicago Electrical Show, Jan. 15 to 29 (inclusive), 1910. Manager, Homer E. Niesz, 115 Dearborn St., Chicago.

Colorado Electric Light, Power & Railway Association. Secretary, J. C. Lawler, Colorado Springs, Colo.

Eastern States Independent Telephone Association of Pennsylvania, New Jersey, Maryland and Delaware. Secretary, H. E. Bradley, 135 South Second St., Philadelphia, Pa.

Electric Vehicle and Central Station Association. Secretary, H. T. Sands, 139 Pleasant St., Malden, Mass.

Electric Club, Chicago. Secretary, W. S. Taussig, 448 Commercial National Bank Building, Chicago. Meets every Wednesday noon at Chicago Automobile Club.

Electric Contractors' Association of New York State. Secretary, Geo. W. Russell, Jr., 25 West 42d St., New York.

Electric Trades Association of Philadelphia. Secretary, J. W. Crum, 1324 Land Title Building, Philadelphia, Pa. Meetings, second and fourth Thursdays of each month.

Electrical Contractors' Association of State of Missouri. Secretary, Charles J. Sutter, 1220 Pine St., St. Louis, Mo.

Electrical Salesmen's Association, Secretary, Francis Raymond, 209 State St., Room 1002, Chicago. Annual meeting, Chicago, January, each year.

Electrical Trades Association of Canada. Secretary, William R. Staveley, Royal Insurance Building, Montreal, Can.

Electrical Trades Association of Chicago. Secretary, Frederick P. Vose, Marquette Building, Chicago. Next meeting, Chicago, Nov. 4, 1909.

Electrical Trades Association of the Pacific Coast. Secretary, Albert H. Elliott, Harding Building, 34 Ellis St., San Francisco, Cal. Monthly meeting, San Francisco, second Thursday of each month.

Electrical Trades Society of New York (Member National Electrical Trades Association). Secretary, Franz Neilson, 80 Wall St., New York. Board of Directors meets second Thursday of each month.

Empire State Gas & Electric Association. Secretary, Charles H. B. Chapin, 29 West 39th St., New York. Next meeting, New York City, Nov. 17 and 18, 1909.

Florida Electric Light and Power Association. Secretary, G. F. Doig, Gainesville, Fla. Next meeting, Tampa, Fla., April 21, 1910.

Illinois State Electric Association. Secretary, H. E. Chabbuck, Peoria, Ill.

Illuminating Engineering Society. Secretary, P. S. Millar, 29 West 39th St., New York. Sections in New York, New England, Philadelphia and Chicago.

Independent Electrical Contractors' Association of Greater New York. Secretary, J. W. Fluckner, 503 Fifth Ave., New York.

Independent Telephone Association of Southern Indiana. Secretary, E. W. Landgrebe, Huntingburg, Ind.

Indiana Electric Light Association. Secretary, Fred. Leslie, Muncie, Ind.

Internal Combustion Engine Association. Secretary, Walter J. Sittig, 61 Ward St., Chicago.

International Association of Municipal Electricians. Secretary, Frank P. Foster, Corning, N. Y.

International Electrotechnical Commission (international body representing various national electrical engineering societies contributing to its support). Secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England.

International Independent Telephone Association. Secretary, A. C. Davis. Next meeting, Chicago, Dec. 7, 8 and 9, 1909.

Iowa Electric Association. Secretary, W. N. Keiser, Des Moines, Ia.

Iowa Independent Telephone Association. Secretary, W. J. Thill, 208 Des Moines Life Bldg., Des Moines, Ia. Annual meeting, second Wednesday in March each year.

Iowa Street & Interurban Association. Secretary, L. D. Mathes, Dubuque, Ia. Next meeting, Sioux City, April, 1910.

Kansas Gas, Water & Electric Light Association. Secretary, James D. Nicholson, Newton, Kan. Next meeting, Kansas City, 1910.

Kentucky Independent Telephone Association. Secretary, James Maret, Mount Vernon, Ky. Regular meeting, second Tuesday in October, each year.

Maine Electrical Association. Secretary, Fred D. Gordon, Auburn, Maine.

MASSACHUSETTS STREET RAILWAY ASSOCIATION. Secretary, Charles S. Clark, 70 Kilby St., Boston, Mass. Meets second Wednesday of each month, except July and August.

MICHIGAN ELECTRICAL ASSOCIATION. Secretary, A. P. Biggs, Detroit, Mich.

MINNESOTA ELECTRICAL ASSOCIATION. Secretary, B. W. Cowperthwait, Faribault, Minn. Next meeting, St. Paul, third week in March, 1910.

MISSISSIPPI ELECTRIC ASSOCIATION. Secretary, J. A. Abbott, Jackson Ry. & Light Co., Jackson, Miss.

MISSOURI ELECTRIC, GAS, STREET RAILWAY & WATER ASSOCIATION. Secretary, C. L. Clary, Sikeston, Mo. Next meeting, Jefferson City, Mo., April 14, 15 and 16, 1910.

MISSOURI INDEPENDENT TELEPHONE ASSOCIATION. Secretary, G. W. Schweer, Windsor, Mo.

NATIONAL ARM, PIN & BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL DISTRICT HEATING ASSOCIATION. Secretary, W. A. Wolls, Columbus, Ohio. Next meeting, Columbus, Ohio, Nov. 11 and 12, 1909.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive Secretary, T. C. Martin, 33 West 39th St., New York.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, W. H. Morton, 41 Martin Building, Utica, N. Y. Next meeting, Atlantic City, N. J., July 20, 1910.

NATIONAL ELECTRICAL INSPECTORS' ASSOCIATION. Secretary, T. H. Day, 27 Pliny St., Hartford, Conn.

NATIONAL ELECTRICAL TRADES' ASSOCIATION. Secretary, Fred P. Vose, 1343 Marquette Building, Chicago. Next meeting, San Francisco, Cal., June, 1910.

NEBRASKA ELECTRICAL ASSOCIATION. Secretary, Frank McMaster, Beatrice, Neb.

NEW ENGLAND STREET RAILWAY CLUB. Secretary, John J. Lane, 12 Pearl St., Boston, Mass. Meets last Thursday of each month.

NEW ENGLAND ELECTRICAL TRADES ASSOCIATION. Secretary, Alton F. Tupper, 84 State St., Boston, Mass. Directors meet first Wednesday of each month.

NEW ORLEANS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, I. G. Marks, 312 Carondelet St., New Orleans, La. Meetings, second and fourth Tuesdays of each month.

NEW YORK ELECTRICAL SOCIETY. Secretary, G. H. Guy, 33 West 39th St., New York.

NEW YORK STATE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, R. M. Eaton, Niagara Falls, N. Y.

NORTHWEST ELECTRIC LIGHT & POWER ASSOCIATION. Secretary, N. W. Brockett, Cataract Building, Seattle, Wash.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

OHIO INDEPENDENT TELEPHONE ASSOCIATION. Secretary, Ralph Reamer, Columbus, Ohio.

OHIO SOCIETY OF MECHANICAL, ELECTRICAL & STEAM ENGINEERS. Secretary, David Gaehr, Schofield Building, Cleveland, Ohio. Next meeting, Lima, Ohio, Nov. 19 and 20, 1909.

OKLAHOMA PUBLIC UTILITIES ASSOCIATION. Secretary, Galen Crow, Guthrie, Okla. Next meeting, Sapulpa, Okla., 1910.

OLD TIME TELEGRAPHERS' & HISTORICAL ASSOCIATION. Secretary, F. J. Scherrer, 195 Broadway, New York.

PACIFIC COAST ELECTRIC AUTOMOBILE ASSOCIATION. Secretary, J. T. Halloran, 604 Mission St., San Francisco, Cal. Next meeting, Oakland, Cal., February, 1910.

PENNSYLVANIA ELECTRIC ASSOCIATION. Secretary, E. L. Smith, Towanda, Pa.

PENNSYLVANIA STREET RAILWAY ASSOCIATION. Secretary, Charles H. Smith, Lebanon, Pa.

PHILADELPHIA ELECTRICAL SHOW. First Regiment Armory, Broad and Callowhill Sts., Feb. 15-27, 1910.

PIKE'S PEAK POLYTECHNIC SOCIETY. Secretary, E. A. Sawyer, Colorado Springs, Colo. Meetings, second Saturday of each month.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, H. H. Norris, Cornell University, Ithaca, N. Y.

SOCIETY OF WIRELESS TELEGRAPH ENGINEERS. Secretary, E. D. Forbes, 96 Franklin St., South Framingham, Mass. Monthly meeting, first Monday of each month. Next annual meeting, Feb. 28, 1910.

SOUTH DAKOTA INDEPENDENT TELEPHONE ASSOCIATION. Secretary, E. R. Buck, Hudson, S. D. Next meeting, Jan. 11 and 12, 1910.

SOUTHWESTERN ELECTRIC & GAS ASSOCIATION. Secretary, E. T. Moore, Dallas, Tex.

STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK. Secretary, G. H. Pardee, care of J. G. White & Co., New York.

VERMONT & NEW HAMPSHIRE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, E. B. Seeley, St. Johnsbury, Vt.

VERMONT ELECTRICAL ASSOCIATION. Secretary, A. B. Marsden, Manchester, Vt.

UNDERWRITERS' NATIONAL EELECTRICAL ASSOCIATION. Secretary Electrical Committee, C. M. Goddard, 141 Milk St., Boston, Mass.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 125 Monroe St., Chicago, Ill. Next meeting, Omaha, Neb., 1910.

WESTERN SOCIETY OF ENGINEERS. Electrical Section, formerly Chicago Electrical Association. Secretary, J. H. Warder, 1737 Monadnock Block, Chicago. Regular meetings, first Friday of each month, except January, July and August. Annual meeting, first Tuesday after Jan. 1, each year.

WIRELESS INSTITUTE. Secretary, Sidney L. Williams, 42 Broadway, New York.

WISCONSIN ELECTRICAL ASSOCIATION. A consolidation of the Northwestern Electrical Association and the Wisconsin Electric and Interurban Railway Association. Secretary, John S. Allen, Lake Geneva, Wis. Next meeting, Milwaukee, January, 1910.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED OCTOBER 26, 1909.

[Conducted by W. F. Bissing, Patent Law, 2 Rector St., New York City.]

937,758. SWITCH STAND; S. K. Blair, Fort Wayne, Ind., and C. B. Hoyt, Bellevue, Ohio. App. filed April 28, 1909. A signal shaft which is independent of the switch operating shaft and in its safety position when the operating shaft is locked in its switch closing position.

937,759. PROCESS OF AN APPARATUS FOR THE PRODUCTION OF IONS; L. I. Blake, Denver, Col. App. filed May 16, 1908. Electrically charges by an external source of electro-motive force an incandescing body such as a conducting gas supply pipe.

937,761. TROLLEY; O. W. Brenizer, Philadelphia, Pa. App. filed April 21, 1905. Spring pressed arms rise on opposite sides of the wheel above the wire to keep the wheel from leaving the wire.

937,776. APPARATUS FOR HEATING WATER; A. C. Dunham, Hartford, Conn. App. filed Jan. 28, 1909. A cold water chamber having a portion heated by a resistance coil, the heated water being transferred to a hot water tank.

937,777. APPARATUS FOR HEATING WATER; A. C. Dunham, Hartford, Conn. App. filed Jan. 28, 1909. Automatically heats a portion of the water in a cold water chamber by a resistance coil and controls the amount of heat supplied, then transfers it to a hot water tank.

937,832. TELEPHONE EXCHANGE SYSTEM AND APPARATUS; R. H. Manson, Elyria, Ohio. App. filed Nov. 15, 1904. Common battery system in which a single relay combines the functions of the line and cut-off relays.

937,837. SIGNAL SYSTEM; W. Mears, Cleveland, Ohio. App. filed Nov. 27, 1907. For trolley roads in which an auxiliary conductor is strung parallel to the wire and the trolley wheel brings the trolley wire into contact with the conductor, thus closing a signal circuit.

937,839. AIR BRAKE; L. E. Morel, St. Hyacinthe, Quebec, Canada. App. filed July 14, 1909. An air brake in which the exhaust valve is electrically controlled.

937,855. PROCESS OF PRODUCING AND REFINING STEEL; F. C. Perkins, Buffalo, N. Y. App. filed May 11, 1908. Electrically treats the molten iron from a glass furnace with the heat produced by an arc or arcs formed between the slag of a bath and electrodes consisting of cored carbons.

937,857. PENDANT SWITCH; J. G. Peterson, Hartford, Conn. App. filed Jan. 5, 1909. Oscillating snap push button switch, in which a spiral spring is so arranged as to throw the yoke and brushes after compression.

937,858. COMBINED LAMP SOCKET AND AUTOMATIC SWITCH; J. W. Phelps, Detroit, Mich. App. filed Dec. 31, 1908. An insulator block having a socket portion and a latter extension with a thermodynamic switch mounted in a recess in the block.

937,859. MOTOR VEHICLE; H. Pieper, Liege, Belgium. App. filed Jan. 25, 1907. A gas engine drives the vehicle and a dynamo motor is connected to another driving wheel to drive the vehicle supplied by a storage battery.

937,867. STRAIN INSULATOR FOR ELECTRIC LINES; E. E. Rose, Swissvale, Pa. App. filed Jan. 10, 1908. The parts are formed of metallic and insulating materials carrying the strains and an outer casing is yieldingly secured to the parts and not subject to strain.

937,877. TRANSFORMER; F. M. Slough, Elyria, Ohio. App. filed Sept. 11, 1907. A telephone ringing system for harmonic signaling in which the secondary winding of the transformer is separated from the primary to permit magnetic leakage which smooths out the wave form.

937,896. STRAIN INSULATOR; T. Varney, Pittsburg, and E. E. Rose, Swissvale, Pa. App. filed Jan. 10, 1908. Consists of two duplicate members whose inner ends are provided with external screw threads and a coupling sleeve into which said ends are screwed.

937,897. STRAIN INSULATOR; T. Varney, Pittsburg, Pa. App. filed Jan. 10, 1908. A strain insulator comprising parts formed of metallic and insulating materials carrying the strain and a segmental casing having sealed joints and enclosing the parts but relieved from the strain.

937,901. TELEPHONE REPEATER APPARATUS; N. G. Warth, Gallipolis, Ohio. App. filed Dec. 20, 1907. A relay whose windings can be changed to meet the particular or respective use, according to the requirements of the inventions shown in certain prior patents, for example 845,282.

937,909. METHOD OF WIRING TELEPHONE SWITCHBOARDS; C. S. Winston, Chicago, Ill. App. filed Dec. 27, 1904. Provides a plurality of terminals in a group which by means of short connecting wires will change the system from either the magneto lamp plan to a common battery system.

937,918. ELECTROLYTIC APPARATUS; A. Brichaux, Brussels, Belgium. App. filed Oct. 4, 1898. Two communicating vessels with a dense electrolyte in one and less dense in the other above the former, with electrodes arranged in contact with the electrolyte layers.

937,919. ELECTRIC ALARM; R. C. Bronson, Chicago, Ill. App. filed Oct. 12, 1908. By turning a cylinder, the striking mechanism in any desired number of rooms is operated.

937,935. TROLLEY POLE; J. Harsen, New York, N. Y. App. filed Aug. 25, 1908. An adjustable pole for rounding curves which is divided into sections pivoted together so that the portion carrying the reel may turn transversely to the line of travel.

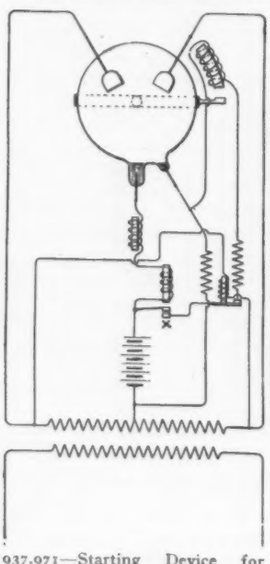
937,941. ELECTRIC PROTECTION SYSTEM; O. Jacobson, Hamilton, Ohio. App. filed Nov. 23, 1908. For protecting a safe whereby the safe door cannot be opened before moving the combination lock without ringing an alarm.

937,957. ELECTRIC SWITCH MECHANISM; J. G. Peterson, Hartford, Conn. App. filed Dec. 10, 1908. A rotary snap switch with an improved commutator. The commutator has four integral arms projecting from the surface of the plate and carrying pole pieces.

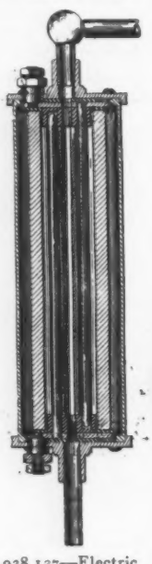
937,971. STARTING DEVICE FOR VAPOR-CONVERTERS; P. H. Thomas, Montclair, N. J. App. filed May 11, 1905. Avoids reversing the polarity of storage batteries used in starting a vapor converter. Provides a flow of current which is opposite to the normal direction and utilizes the cathode activity thus produced to overcome the starting resistance of the normal cathode.

937,984. INSULATOR BRACKET; E. V. Brown, New Albany, Ind. App. filed Feb. 27, 1909. Has a vertical body portion with projecting arms and a rearwardly extending flange with a wedge movable over it to engage the joints.

938,026. LOCKING AND SIGNALING SYSTEM FOR TELEPHONE REGISTERS; A. S. Spiegel, Chicago, Ill. App. filed June 10, 1907.



937,971—Starting Device for Vapor Converters.



938,127—Electric Heater.

938,238—Electric Attachment Plug.

Central station meter for measuring telephone service in which the meter is incapable of operation a second time during the period of a single insertion of the answering plug.

938,033. MEANS FOR HOLDING IN PLACE LAMINATIONS OF ALTERNATING CURRENT DYNAMOS AND MOTORS; C. E. Willey, Louisville, Ky. App. filed Dec. 12, 1908. A frame with a split ring to hold the laminations in place.

938,038. INCANDESCENT LAMP SOCKET; H. A. Bretz, Chicago, Ill. App. filed March 4, 1907. The lamp carries an electromagnet which when the current is on supports the lamps in position on a metal surface without using a hanger.

938,039. APPARATUS AND SYSTEM FOR MEASURING TELEPHONE SERVICE; S. H. Browne, Pittsburg, Pa. App. filed Jan. 17, 1905. Mechanism for measuring telephone service wtih means for counting and recording the total number of successful connections resulting from calls originating upon any one telephone line having an automatic switch.

938,060. APPLIANCE FOR USE WITH TELEPHONE TRANSMITTERS; C. J. Kintner, New York, N. Y. App. filed June 1, 1909. A secret appliance to prevent other persons in the room overhearing a conversation by means of a shield and ring attached to the mouth piece.

938,092. STRAIN INSULATOR; T. Varney, Pittsburg, Pa. App. filed June 8, 1907. Comprises a metal tube having paper ends with metal bushings therein and metal plugs insulated from the bushings.

938,127. ELECTRIC HEATER; H. W. DENHARD, San Francisco, Cal. App. filed June 25, 1908. Contains a fluid chamber, some of the fluid surrounding the electrodes so as to be heated by the passage of the current.

938,137. LIGHTNING ROD; J. F. Goetz, Hartford, Wis. App. filed April 6, 1908. The lightning rod is made of tubular sections and can move up and down slightly in winter or in summer to compensate for changes in temperature.

938,154. TELEPHONE SYSTEM; O. M. Leich, Genoa, Ill. App. filed June 19, 1908. An improved system for railway service for transmitting messages having a metallic line circuit, a return circuit, a plurality of substations, a telephone set at each station and electromagnetic means for connecting adjoining circuits in tandem.

938,155. SIGNALING SYSTEM; O. M. Leich, Genoa, Ill. App. filed Feb. 15, 1909. A metallic telephone circuit on which are arranged a plurality of non-interfering telephone circuits in combination with selective signaling means for calling the telephones, and signaling means for substation tandem telephones arranged on the local tandem circuits.

938,160. SYSTEM OF ELECTRIC MOTOR CONTROL; J. N. Mahoney, Wilkinsburg, Pa. App. filed Jan. 10, 1908. For controlling mining locomotives carrying a trolley and a gathering reel with independent switches for connecting the trolley and the reel to the controller and means for automatically preventing closing the two switches simultaneously.

938,175. ELECTRICALLY OPERATED RELEASE FOR DOORS; W. H. Snyder, Ashbourne, Pa. App. filed April 6, 1909. For stall doors of fire houses in which a bolt is held by a retaining device controlled by an electric circuit and controlling an alarm circuit.

938,190. AUTOMATIC HEAT REGULATING INCUBATOR; W. W. Wetherla, Chicago, Ill. App. filed Dec. 19, 1909. Incubator for infants with automatic electric heating appliance.

938,191. CIRCULATING DEVICE FOR MERCURY; J. Whiting, Boston, Mass. App. filed Dec. 16, 1908. For pumping or circulating liquid metal in an electrolytic cell such as used for decomposing alkali chlorides by means of a wheel having pockets.

938,212. ELECTRIC LAMP SOCKET FASTENING; H. Christensen, Seattle, Wash. App. filed Dec. 3, 1908. An annual clamping member whose interior is cone shaped, one side being formed into a cammed surface.

938,213. ELECTRIC LAMP SOCKET RETAINER; H. Christensen, Seattle, Wash. App. filed March 29, 1909. An insulator body having a shoulder arranged in a spiral and a retainer on the body with an end portion extending in a spiral path engaging the shoulder.

938,216. MESSENGER HANGER; C. E. Cook, Chicago, Ill. App. filed July 31, 1908. A clamp having a channel shaped jaw co-operating with a trough for clamping a rope therein.

938,237. ELECTRICALLY OPERATED WATER HEATER; J. A. Hunnewell, Lowell, Mass. App. filed April 4, 1908. A heating coil is arranged in a U-shaped tube through which the water flows.

938,238. ELECTRIC ATTACHMENT PLUG; S. W. Ito, San Francisco, Cal. App. filed March 18, 1909. Avoids twisting the conducting cords. A crank arm is moved to engage spring tips and the plug is inserted into the socket without twisting.

938,312. BATTERY; W. Gardiner, Chicago, Ill. App. filed Feb. 17, 1908. The annode contains molybdenum and the cathode likewise.

938,313. STRAIN RELIEF FOR ELECTRICAL DEVICES; G. W. Goodridge, Bridgeport, Conn. App. filed June 30, 1908. A rosette having a clamping device and binding screws to grip the insulated portions of the wires.

938,316. PROCESS AND APPARATUS FOR THE PRODUCTION OF COMPOUNDS OF OXYGEN AND NITROGEN; F. Haber and A. Koenig, Karlsruhe, Germany. App. filed July 15, 1908. A cylindrical vessel having electrodes situated in and parallel to the axis of the vessel, entry and exit openings to the gases and means for maintaining the gases in the vessel under reduced pressure.

938,324. AUTOMATIC CIRCUIT BREAKER; J. N. Kelman, Los Angeles, Cal. App. filed April 22, 1907. An oil circuit breaker for high voltages. Details.

938,331. BLOCK SIGNAL SYSTEM; J. D. Nix, Ferriday, La. App. filed Sept. 11, 1908. The apparatus is arranged on the engine and automatically operated by electric current from a generator carried on another engine when in the same block, thus shutting off the steam and applying the brake.

938,337. TELEGRAPHY; J. F. Richardson, Montreal, Canada. App. filed Jan. 11, 1907. For utilizing alternating currents in telegraphy. The relays include arc shaped solenoids with arc shaped cores.

938,345. ELECTRICAL SIGNALING SYSTEM; F. M. Slough, Elyria, Ohio. App. filed June 19, 1906. A harmonic signaling system utilizing a battery providing two electromotive forces of equal amounts but opposite sign, and suitable transformers.

938,351. ELECTRIC SMELTING FURNACE; E. R. Taylor, Penn Yan, N. Y. App. filed June 12, 1908. For smelting iron ores by a continuous process, by means of a furnace with horizontal electrodes and a body of stack form containing a working chamber into which the electrodes extend and provided with a central flue shaped feed passage.

938,352. ART OF ELECTRIC SMELTING; E. R. Taylor, Penn Yan, N. Y. App. filed March 3, 1909. See 938,351.

938,368. ELECTRIC CIGAR LIGHTER; S. A. Campbell, Newton, Mass. App. filed Aug. 14, 1908. The lighting flame is produced from a wick lighted by an electric spark, which is snuffed by a cover worked by the handle.

938,373. PROTECTING BOX FOR ELECTRIC WIRING; H. W. Eden, Detroit, Mich. App. filed Dec. 16, 1908. A box body with slots and notches and a fillet having projections engaging the notches.

938,394. CIRCUIT CLOSING AND BREAKING DEVICE FOR ELECTRICALLY OPERATED ANNUNCIATORS AND THE LIKE; A. May, New Orleans, La. App. filed March 25, 1909. The conductor is provided with pivotally mounted weighted arms electrically connected thereto and a device on the car has an insulated contact which engages the arms in the travel of the car.

938,399. ELECTRICAL EXERCISING APPARATUS; W. C. Schaufler, Amsterdam, N. Y. App. filed July 9, 1908. Currents are sent through the body of the operator when pulling the elastic cords of the exerciser.

938, 409. STRAIN INSULATOR; C. F. Boldman, Canton, N. C. App. filed April 22, 1908. Includes a strain rod passing through the sleeve and having a head with a strain member clamped around the sleeve.

938,414. CONFECTIONER'S MELTING TABLE; G. F. Dickson, Chicago, Ill. App. filed Oct. 19, 1908. For manufacturing chocolates in which a water bath is heated electrically .

938,429. MECHANISM FOR DANGER SIGNALS FOR RAILROADS; R. E. Murphy, Colorado Springs, Col. App. filed Sept. 16, 1907. Supplies torpedoes as a train passes by electro-mechanical means.

938,445. GLASS STORAGE BATTERY CASE; F. L. O. Wadsworth, Sewickley, Pa. App. filed July 27, 1907. Separate sheets of glass are arranged on opposite sides and have parallel ribs pressed therein.

938,451. PROCESS OF MAKING ACTIVE MATERIAL FOR STORAGE BATTERY ELECTRODES; J. W. Aylsworth, East Orange, N. J. App. filed Feb. 6, 1908. Electrolytically forms the active material out of a cyanid solution.

13,027. (Reissue.) ELECTRIC FURNACE: A. C. Higgins, Worcester, Mass. App. filed Oct. 12, 1908. Has water cooled walls and a removable water cooled casing projecting into the charge between the electrodes.